

# SPACE WORLD

The news magazine of Astro - Science

Covers from

May 1960 to December 1988



First Issue - May 1960



Last Issue - December 1988



# Table of Contents

Space World, appearing in May 1960 was edited by Otto Oscar Binder, a science fiction author, but best known for producing hundreds of super-hero Marvel comic books dating from World War II. The comic book profits he invested in “Space World” were lost as “the public stayed away from it in droves”. Losing money, Binder and his partners were forced to declare bankruptcy and sell the magazine to Ray Palmer in 1963. Editor of the successful science fiction magazines “Amazing Stories” and “Fate”, Palmer was able to successfully continue Space World for the next 25 years.

The final Space World issue was December 1988.

From May 1960 to December 1988, there were 313 Space World magazines issued. (Plus, one *Jets and Rockets* magazine which was sent to subscribers in place of the August 1962 issue.)

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**SPACE** WORLD

1960



MAY 50¢

# SPACE WORLD

The news magazine of Astro-Science

There's a  
SPACE JOB  
FOR YOU

WERNHER von BRAUN:  
"I Reached for the Stars"

WILLY LEY  
John R. Pierce  
Isaac Asimov  
M. Vassiliev

The RUSSIAN SIDE  
of the MOON

Luniks' new facts  
explode old theories





JULY 50¢

# SPACE WORLD

The news magazine of Astro-Science

THE NEXT 10 YEARS  
IN SPACE TRAVEL

How to get a  
**FREE** Science Education

Krafft Ehricke • John R. Pierce • Willy Ley • Norman Lee Barr



# SPACE WORLD

The news magazine of Astro-Science

SENATOR STUART SYMINGTON

T. Keith Glennan

Willy Ley

O. O. Binder



AMATEUR ROCKETRY: Good or Bad?

YOUR AIR FORCE SPACE CAREER



NOVEMBER 50c

# SPACE WORLD

The news magazine of Astro-Science

TO MARS — AND BEYOND  
The exciting story of Project Parsecs

WERNHER VON BRAUN

KRAFFT EHRLICHE

WILLY LEY

WELLWOOD BEALL

Orbiting with the FIRST ASTRONAUT • America's SPY SATELLITES



**SPACE** WORLD

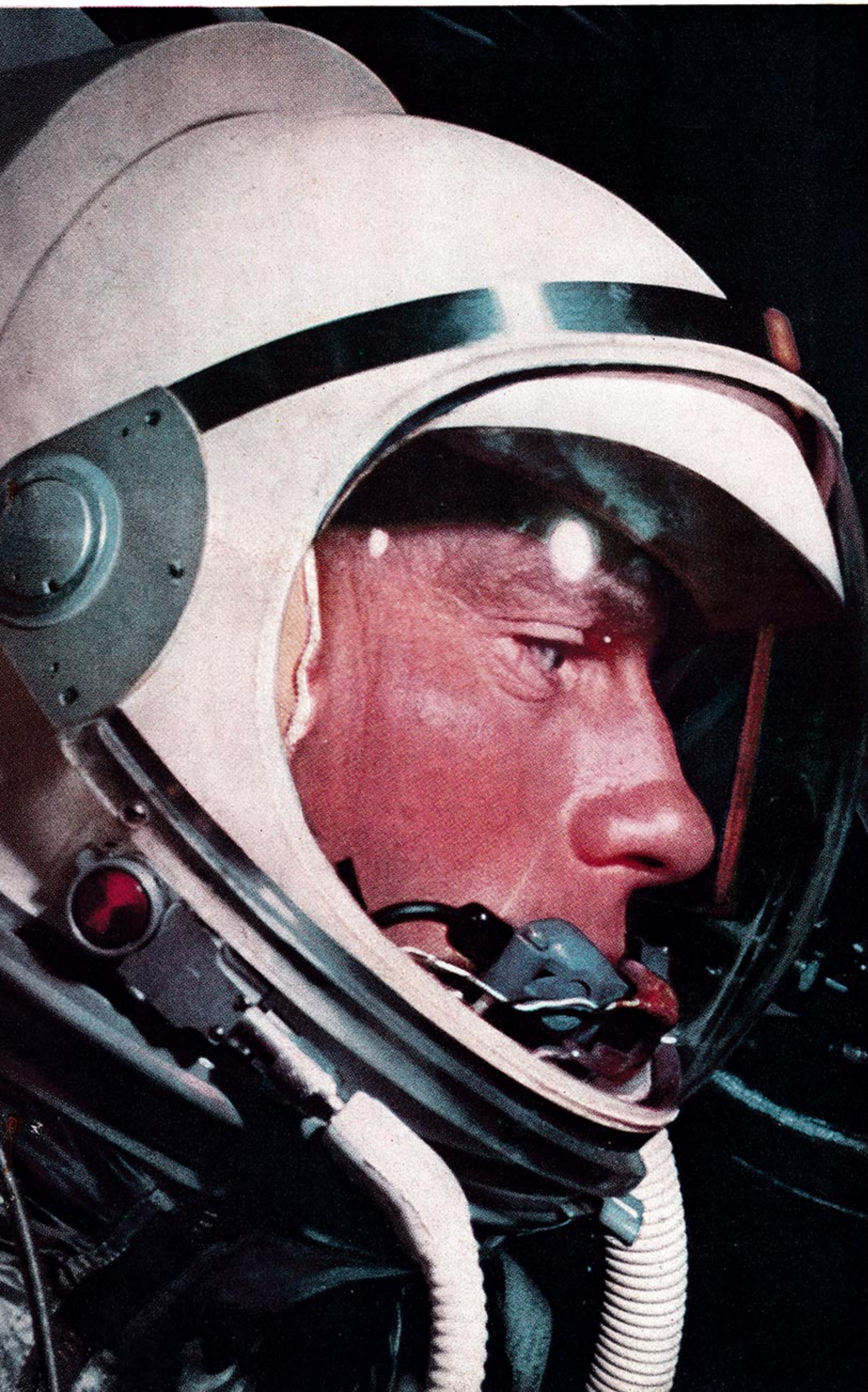
1961



JANUARY 50c

# SPACE WORLD

The news magazine of Astro - Science



**SPECIAL ISSUE**

Complete story of the  
Great Adventure—

## MAN IN SPACE

THE  
FLIGHT OF THE  
FIRST  
ASTRONAUT

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Ray Bradbury  
Major Victor Hammond  
Willy Ley



# SPACE WORLD

MARCH 50c

The news magazine of Astro - Science

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TESTING OUR  
ROCKET ENGINES



GEN. MEDARIS: Right or wrong?

'FLYING SAUCER' PHENOMENA

First authentic USAF lunar map

HOW WE'RE MAPPING THE MOON



# SPACE WORLD

APRIL 50c  
VOL. 1, NO. 7

The news magazine of Astro - Science



- ▶ Wings Into Space
- ▶ Nuclear-Powered Rockets
- ▶ Life In a Missiletown
- ▶ Techniques of Space Refueling
- ▶ Establishing a Lunar Colony

CAPT. ROBERT WHITE  
PILOT OF THE X-15

Willy Ley • Hugh Dryden • John W. Clark • Charles E. Kaempfen



# SPACE WORLD

JUNE 50c  
VOL. 1, NO. 8

The Magazine of Space News

- ▶ The Russian Venus Probe
- ▶ Can Man Survive in Space?
- ▶ America's New Super Rocket
- ▶ Engineering a Mars Colony
- ▶ Dr. Wm. Helvey: Space Medic
- ▶ A New Approach to Telemetry

FINAL CHECK-OUT  
FOR MERCURY CAPSULE

Wernher von Braun

Fred Whipple

Willy Ley

John Parry





# SPACE WORLD

AUGUST 50c  
VOL. 1, NO. 9

The Magazine of Space News

**EXCLUSIVE - A Russian scientist reports on  
THE SOVIET MAN IN SPACE**

**A list of every rocket shoot ever made  
WILLY LEY'S COMPLETE ASTRO-CALENDAR**



Alan Shepard



Virgil Grissom



John Glenn

**THE FULL STORY:  
HOW OUR SPACEMEN  
ARE CHOSEN**





# SPACE WORLD

SEPT. 50c  
VOL. 1, NO. 10

The Magazine of Space News

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ORBITAL FLIGHT

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Isaac Asimov

Eilene Galloway

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**THERE IS INTELLIGENT LIFE ON MARS!**

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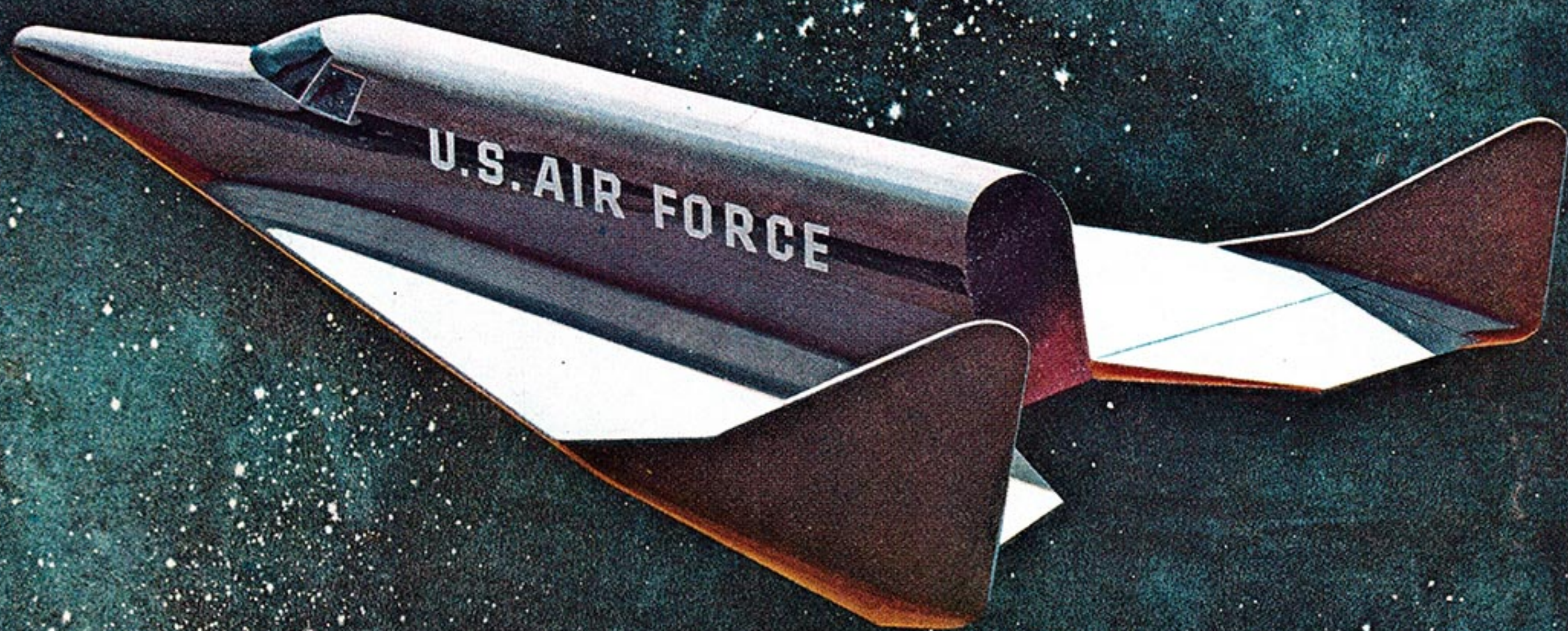
ORD AVE



# SPACE WORLD

OCTOBER 50c  
VOL. 1, NO. 11

The Magazine of Space News



**40 BILLION DOLLARS** - Is President Kennedy throwing it away  
trying to put American men into space?



WILLY LEY REVEALS THE FULL STORY-

**The Russian 'Murders' In Outer Space**



# SPACE WORLD

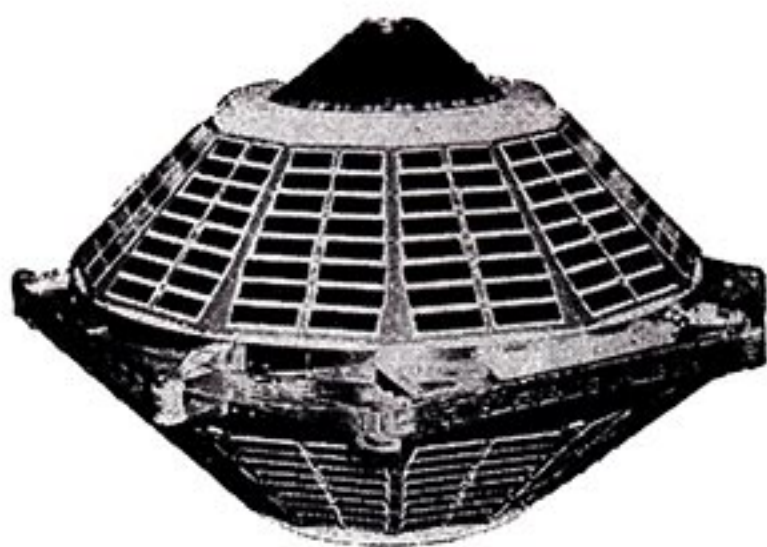
NOVEMBER 50¢

The Magazine of Space News

Special 20-page feature: The full story of America's

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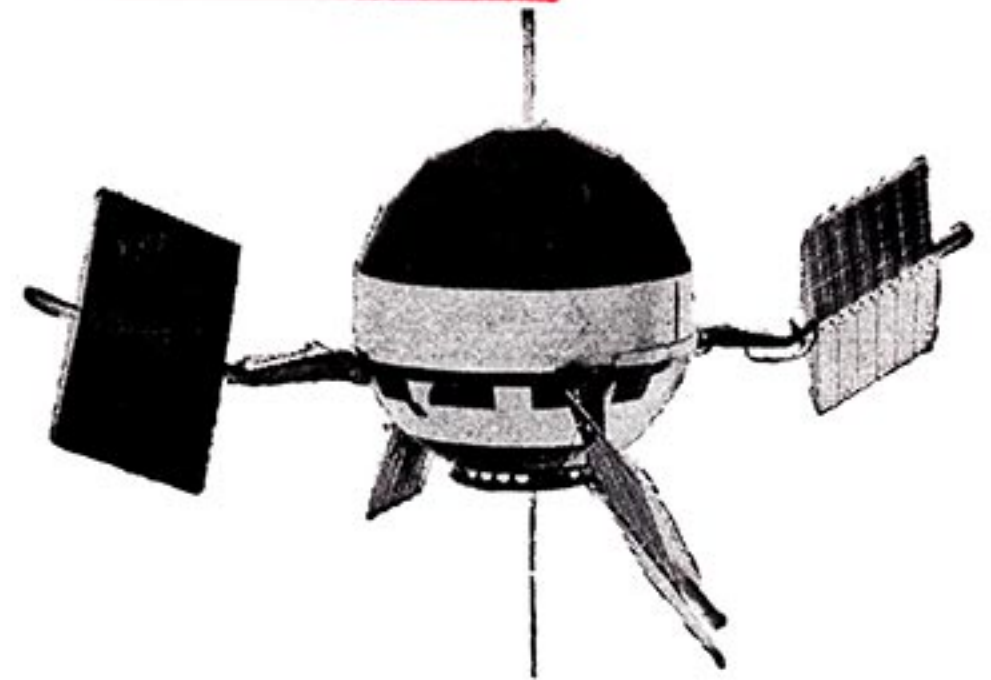
# RACE



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# INTO

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# SPACE

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A complete illustrated guide to rockets, missiles  
and spacecraft of the U.S.A.

Many facts and photos specially declassified.

A reference work unsurpassed in scope and coverage.

LIFE ON THE MOON? • ROCKET MAIL • REPORT FROM RUSSIA



DECEMBER 50¢

# SPACE WORLD

The Magazine of Space News



Alan Shepard



Virgil Grissom



Yuri Gagarin



Gherman Titov

**A SPECIAL ISSUE  
PREPARED IN COOPERATION  
WITH THE UNITED STATES AIR FORCE**

## MEN IN SPACE

- Are the Russians really ahead?
- Training the Dyna-Soar pilots
- The Danger Zone in outer space
- What's next in Space Travel



**SPACE** WORLD

1962



JANUARY 50¢

# SPACE WORLD

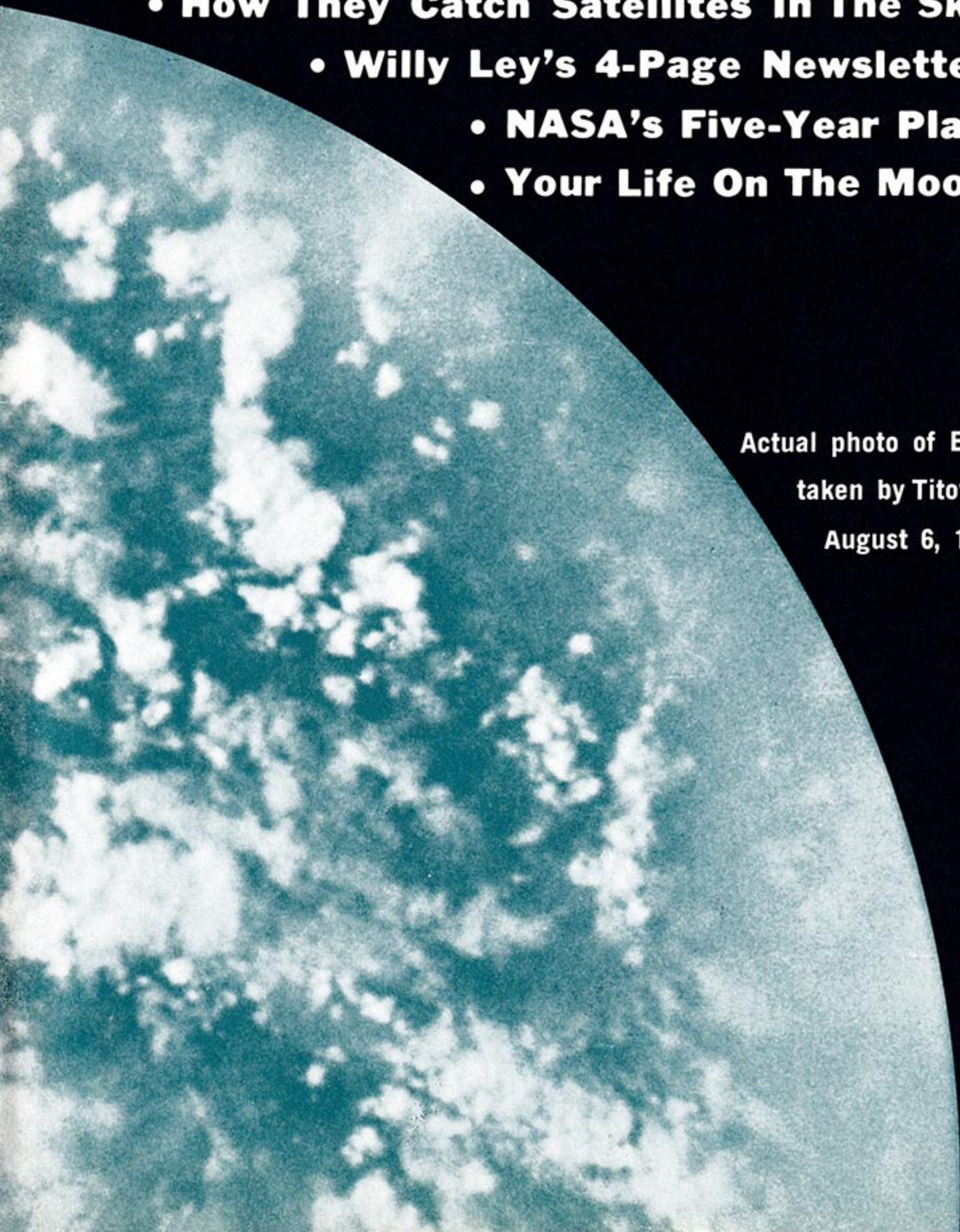
The Monthly Magazine of Space News

**EXCLUSIVE! How It Felt To Ride The Vostok Into Space:  
GHERMAN TITOV'S OWN STORY!**

## **IN THIS ISSUE:**

- **How They Catch Satellites In The Sky**
- **Willy Ley's 4-Page Newsletter**
- **NASA's Five-Year Plan**
- **Your Life On The Moon**

Actual photo of Earth  
taken by Titov on  
August 6, 1961.





# SPACE WORLD

FEBRUARY 50¢

The Monthly Magazine of Space News



**WAR IN SPACE**  
**CAN AMERICA WIN IT?**



# SPACE

MARCH • 50c

**WORLD**

THE MAGAZINE  
OF SPACE NEWS

**Astronaut's Report:  
'HOW WE TRAINED FOR ORBITAL FLIGHT'**



LIEUTENANT COLONEL  
JOHN H. GLENN



# SPACE

MAY • 50c

**WORLD**

THE MAGAZINE  
OF SPACE NEWS

**The Truth About Khrushchev's Boasts:  
IS SOVIET SPACE SCIENCE FIVE YEARS AHEAD?**



- Can Russian missiles really destroy America?
- Will the Moon be a Russian colony?

**SECOND ANNIVERSARY ISSUE!**



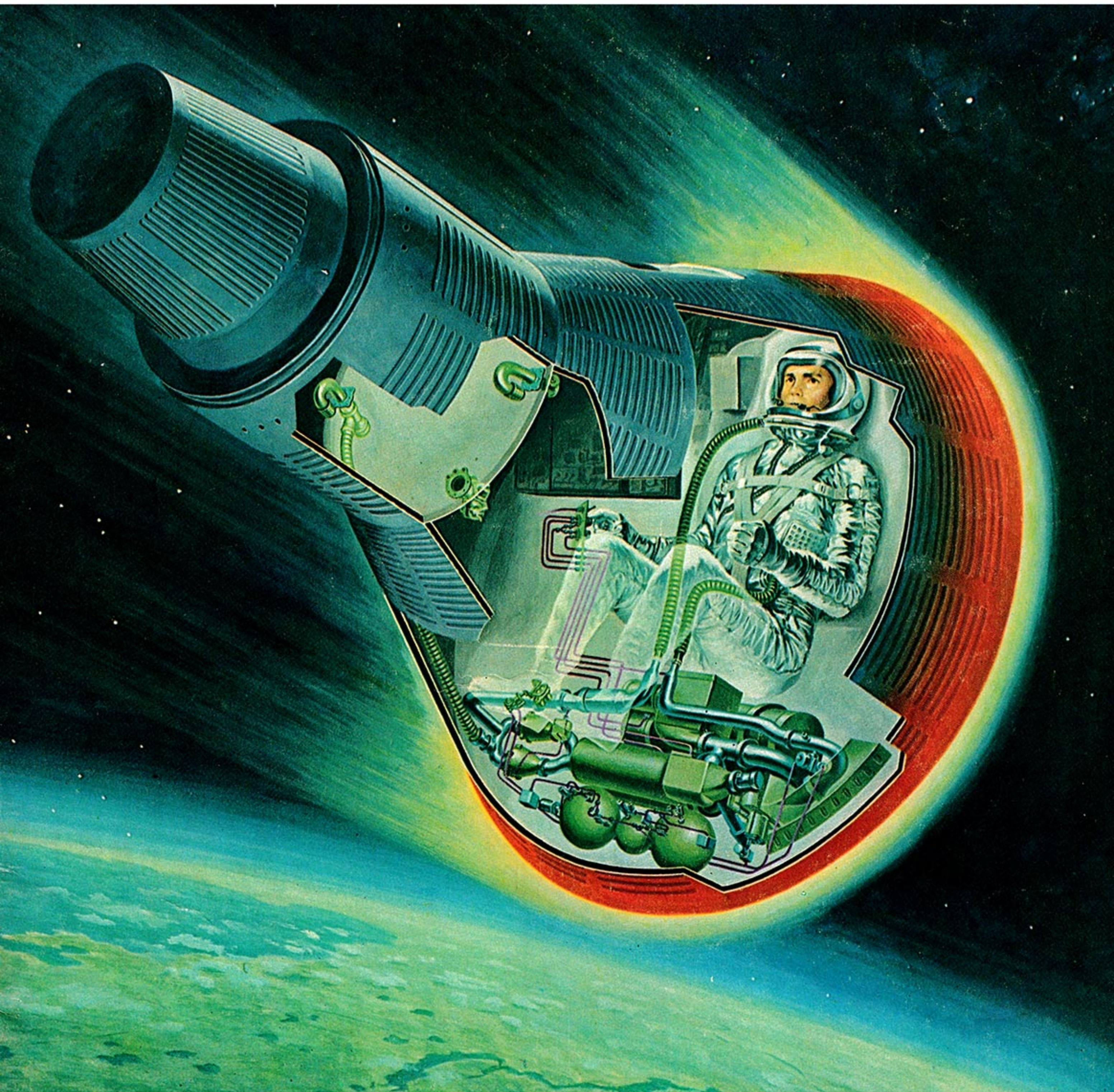
# SPACE

JULY • 50¢

**WORLD**

THE MAGAZINE  
OF SPACE NEWS

**Our next step: 18 TIMES AROUND THE EARTH**



## **SPECIAL JETS & ROCKETS SECTION**

- U-2 Pilots: The lonely heroes
- Are manned Jet Bombers obsolete?
- The Frogmen who save our Astronauts



50¢ AUGUST 1962

# **JETS** AND **ROCKETS**



**I Flew The X-15 To The Edge Of Space, By Major Robert White**

**REVEALED—THE STRANGE SECRET OF RUSSIA'S  
NEW SPACE PLANE • THE JETS THAT CHASE  
OUR MISSILES • BIG NEWS ABOUT DYNA-SOAR**

\*NOTE: There was no August 1962 Space World magazine issued.  
This issue of Jets and Rockets was sent to subscribers instead.



A MESSAGE TO  
SPACE WORLD SUBSCRIBERS

THERE IS NO AUGUST ISSUE OF SPACE WORLD MAGAZINE. THE PUBLISHER OF SPACE WORLD HAS MADE ARRANGEMENTS FOR THIS PREMIER ISSUE OF JETS AND ROCKETS MAGAZINE TO BE SENT TO YOU IN ITS PLACE. WE KNOW YOU WILL ENJOY JETS AND ROCKETS WHICH IS EDITED AND WRITTEN BY MANY OF THE SAME PEOPLE WHO HAVE BECOME SO WELL KNOWN TO YOU IN THE PAGES OF SPACE WORLD.



# SPACE WORLD

Vol. 3, No. 4

Second class postage paid at New York, N.Y.

OCTOBER 1962

## COMPLIMENTARY COPY

You have been chosen to get this complimentary copy of SPACE WORLD because we know that you are interested in the challenge of space.

In SPACE WORLD you will find the whole dynamic story of rockets, satellites and spacecraft - - the fabulous machines and outstanding men behind them - - brought to you in format designed for readers who want dramatic, authoritative and complete coverage of the spaceman's world - AS IT HAPPENS. From tense moments during a countdown at Canaveral through the triumph of vehicles placed into orbit, on into the reaches of space, SPACE WORLD brings you everything that happens.

In addition to all the latest news on the space front, SPACE WORLD will feature in every issue invaluable career aids for students, graduates and technicians, tips about jobs and trends, and news of clubs and other organizations whose work offers stimulation and encouragement for those who want a career in this immense industry of space. A subscription blank is on page 11 for your convenience.

## LETTERS

Dear Sir: I have my first copy of SPACE WORLD in newspaper format and I thought I would let you know that you have my continuing support. I've always found your articles and features most interesting and I expect they will be even MORE INFORMATIVE in this UP TO DATE form. Norman H. Vanasse, Bristol, Conn.

Dear Sir: While reading the Sept. 1962 issue of SPACE WORLD, my attention centered on a mistake in the NASA launching schedule. Ranger V will be launched from Cape Canaveral, as were its four predecessors, not from PMR. In turn, Echo II, unlike Echo I, will be launched into polar orbit from the PMR. Still, let me say that in whatever form SPACE WORLD is printed it is a great help in clarifying many areas of our space program. The newspaper is fine with me. Alan B. Metzger, Smithsburg, Md.

(The two listings for Ranger and Echo were inadvertently switched. Glad you feel the true value of what we turn out is not in PAPER OR INK... but in DATA AND INFORMATION... on which the new SPACE WORLD holds up its head proudly before the old.....Ed.)

Dear Sir: Your announcement that SPACE WORLD will no longer be issued as a magazine is a disappointment to me in that I was having them bound in book form from year to year. But I can also understand your position. Your scientific coverage is STILL THE BEST there is to be had. I will still support you and am sending \$5.00 for a renewal of SPACE WORLD. Stanley E. Kendall, Morton Grove, Ill.

(Newsprint can also be bound and

protected in plastic film. Inquire at your stationers. Many thanks for your continued support.....Ed.)

Dear Sir: I thought I had obtained all copies of your unbeatable magazine from the start, but in checking over my files recently, I discovered several missing. Are back issues available? How far back? At what price? Roger Hanelt, Clear Lake Highlands, Calif.

(We have been overwhelmed with similar requests for back issues of SPACE WORLD. For the benefit of all readers, here is a list of those back issues that are available: October 1961  
November 1961  
January 1962  
February 1962  
March 1962  
April 1962  
May 1962  
July 1962

Some of these issues are in small quantities, and are available on a first come, first served basis. Please send fifty cents to cover handling, mailing and cost of each magazine to Space World, 570 Fifth Avenue, New York 36, N. Y. Note: When ordering, state MONTH AND YEAR.)

Dear Sir: I wish to correct an error you made in your September issue of SPACE WORLD. You identified Arthur C. Clarke as John R. Pierce and vice versa. I am a great fan of both and was very glad to see them mentioned in your magazine. Ida Ipe, Youngstown, Ohio. (Our theory is that the captions were switched during an overpass of Teletar. Well, it does everything else, Ed.)

Dear Sir: On the weekend of the

## PRESIDENT PLEDGES SPACE WIN

During his recent four-day tour of Cape Canaveral, the Saturn works at Huntsville, the Houston Moon Center and other space facilities, President John F. Kennedy renewed his resolve to lead the American people to first place in space. This is clear from these excerpts out of a speech delivered at Rice University on September 12:

"The exploration of space will go ahead whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space.

"This generation does not intend to founder in the back wash of the coming age of space. We mean to be a part of it - we mean to lead it. For the eyes of the world now look into space to the moon and to the planets beyond - and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace.

"But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why 35 years ago fly the Atlantic? Why does Rice play Texas?

"We choose to go to the moon in this decade, and do the other things not because they are easy, but because they are hard; because that

But many experts are privately predicting that the total figure may go beyond \$8,000,000,000 - - particularly if Russia pulls a successful orbit rendezvous maneuver



Future site of moonship launches is shown in this artist's projection of facility at Cape Canaveral. Building plans call for completion of complex in less than two years.

goal will serve to organize and measure the best of our energies and skills.

"To be sure - to be sure, we are behind and will be behind for some time in manned flights but we do not intend to stay behind and in this decade we shall make up and move ahead.

"What was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space.

"Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why did he want to climb it. He said:

"Because it is there. Well, space is there, and we're going to climb it. And the moon, and the planets are there, and new hope for knowledge and peace are there. And therefore, as we set sail, we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked."

To back up his promise, it is reliably reported that JFK plans to raise the space budget from fiscal 1963's \$5.4 millions to at least \$7 millions in Feb. 1964. This would divide up to give NASA about five billion and the USAF two billion.

or some other important space feat before the end of 1962.

This may also change the proportions between NASA and USAF space funding. Any Soviet space "first" that carries a possible military threat to America in the future would blow the lid off the NASA-USAF rivalry for control of our long-range space program, a controversy that had been simmering on the back-burner ever since Gagarin's first manned flight and reached a boil when the cosmonaut twins almost kept a tryst in space last month.

Rendezvous can lead to an orbital platform soon after. An orbital platform can become a way-station to the moon... OR a multi-man MILITARY SPACE BASE circling earth daily, and crossing America at least four times each 24 hours. The latter has obvious implications - surveillance, patrol, even domination of earth and space - that worry the USAF, which is why they continue their campaign for a stronger space role. The issue may be decided not by what they think in Washington but what they think - and do - in Moscow. Any Soviet space move from now on could be the fuse that sets off the USA space program powderkeg.

## 1953 POLL

In the summer of 1953, Gerry de la Ree, (science-fiction fan and feature writer for New Jersey BERGEN EVENING RECORD) conducted a "space prophecy" poll among experts and science-fiction writers of 1953. The time was four years before Sputnik, in the period when the ICBM was still a controversial missile sometimes pronounced "ridiculous." The largest boosters known in America were captured V-2's of 56,000 pounds thrust and the native Viking with 20,000 pounds of thrust. The 200,000-pound thrust of the early Navaho (jet-powered ICBM) missile was only being tested.

The Jupiter, Juno, Atlas, Thor, Titan were all gleams in rocketmen's

(NASA, please note.....Ed.)



# SPACE WORLD

Volume 3, No. 6

Second Class Postage Paid At New York, N.Y.

DECEMBER 1962

**IN THIS ISSUE**  
**DEATH RAY DEFENSE**  
**COLD SHADOW OF THE MOON**  
**RUSSIAN SCIENTIST'S PLEA**  
**FREE! AEROSPACE ITEMS**

## SATURN FACES BOOSTER BOTTLENECK

A week before Thanksgiving, Americans were given something to be truly thankful for in our space program - the third flawless flight in the Saturn C-1 booster test series. Like SA-1 in October 1961 and SA-2 in April of this year, the SA-3 (flight code) of November 16th was "101%" perfect.

This could hasten the present timetable for SA-4 (fall, 1962) and SA-5 (spring, 1963) except for one thing - no second stage is ready.

One can picture the ridiculous - and tragic - situation of rusting Saturn boosters waiting all in a row while a lackadaisical upper-stage program belatedly produces its first workable hardware. This is no reflection on Douglas, prime contractor for the S-IV second stage. The blame falls squarely on NASA's experts in inept timetabling of what goes on top of its mighty booster. They failed to realize that with some 1,500 operational rocket shots behind them (including German V-2's), Wernher von Braun's engineering team would hardly stumble with the Saturn. After all, it's just a bigger rocket but running on the same fuel and utilizing the same technological techniques of gyro-guidance, gimbaled-engine stabilization and all such well-proven gimcracks.

Though generally quick to defend others, von Braun, when interviewed after the last flight of the Saturn, said that the S-IV stage was a "bottleneck." The Saturn C-1's second stage will burn liquid hydrogen fuel in its six RL-10 engines of 15,000 pounds thrust each - the same as the two motors in the ill-starred Centaur that is now two years behind schedule. If the Centaur's bugs crop up to plague the S-IV, then Block #2 of the two-block (two-stage) C-1 will truly "BLOCK" our manned spaceflight program.

For the Saturn C-1 is scheduled to first launch the 3-man Apollo craft into earth-orbit tests, leading to the later moon flights. A late S-IV means a late Apollo-A, which means a late Apollo-B circumlunar flight, which means a late Apollo-C moon touchdown. Thus, the chain of disaster tracing from one weak link in our big booster project can snatch away the Moon Prize in the Space Race.

Getting back to a more pleasant topic, the Saturn #3 flight not only exceeded all expectations but tossed in two unexpected bonuses:

- A "roll" motion of 4° per second developed just before end of the powered phase, allowing tracking engineers to find the best propagation (beam) angle for the booster's telemetry antennas. This also proved out the "anti-slosh" system of the propellant tanks.
- After deliberate blow-up of the booster at its peak height, five of the 27 telemetry links continued transmitting for several minutes. The canister in which they were contained had evidently departed in one piece. This telemetry data is giving valuable information on thin-air concussion effects at high altitudes - something totally unknown before.

But the best windfall, of course, was simply the superb performance of the booster in flight. Unbelievably the Saturn with its eight H-1 (Redstone) engines is more reliable than the single Redstone itself. Some experts are advising NASA to skip time-wasting and redundant interim shots and schedule SA-8 to be operational instead of SA-11. The time saved would be 6 months or more.

But to what avail, with no second-stages? However, the trick is simply to use the Saturn as a ONE-STAGE launch vehicle, as the Atlas has been used in Mercury liftings. The 2-man Gemini craft, for instance, could be orbited by the solo Saturn. Furthermore, Saturn could hurl a ton-weight probe to Mars or Venus, comparable to the 1,970-pound Mars vehicle Russia launched last November 1. This would superbly beef up our limping planet probe program which, because of Centaur's failures, has had to be relegated to the featherweight lifting capacities of the Atlas-Agena --- payload to planets under 500 pounds. Giant craft 4 times heavier, flung away by the Saturn spacetruck, could contain heavy TV equipment and massive Soviet-style instrumentation. And the first shots - non-manned rating coming sooner - could advance the date of far-planet probes to Mercury, Jupiter and Saturn to late 1963 instead of waiting for the operational (perhaps) Centaur in 1965.

Obviously, the lone-wolf Saturn booster could shove our general space program ahead in mighty leaps. Will NASA seize this miraculous opportunity? Or insist on following its step-by-plodding-step methods, and waste perfectly good payload-carrying Saturns in repetitive tests with dummy payloads? One would need courage to bet optimistically on their verdict.

The Mercury astronauts, insiders say, have privately stated that MR-3 and/or MR-4 (Mercury-Redstone suborbit flights of Shepard and Grissom) were unnecessary - the Soviets skipped them entirely. And with any pushing, the orbital flights from MA-6 to MA-8 (Glenn,

Carpenter and Schirra) could have been done six weeks apart instead of stretching out for a span of almost 8 months. In what is loosely called the manned flight "schedule," NASA has denied the existence of clock, calendar and cosmonaut triumphs.

Unable to hasten the launch-time schedule for his Saturns, von Braun and test crew nevertheless planned a unique experiment with the next SA-4 shot of 1963's first quarter. One of the eight H-1 engines will be deliberately made dead, so it doesn't fire with the other 7 at lift-off. The Saturn powerplant is engineered to take-off, and stay in balance, if one - any one - of the engines fails. Proof of this in an actual flight test will be another major landmark in booster technology.

From SA-5 on (late 1963), the Saturn C-1 will have two "live" stages (if S-IV is ready) and carry boilerplate (non-manned Apollo capsules) into orbit. The Saturn booster from flight #5 on will also produce its full programmed 1.5 million pounds thrust. The three shots so far (and the 4th coming up) were based on minimal H-1 thrusts of 165,000 pounds of push, which will be raised to 188,000 pounds each in the SA-5 vehicle and beyond.

During the recent #3 test and its 10-hour countdown, there was one hold of 45 minutes - for a failure in GSE (Ground Support Equipment). Saturn #3 itself developed no mechanical ill at all and was waiting to go like a champion. It went like a super-champion and is sure to win gold medals in the Space Olympics events lying ahead.

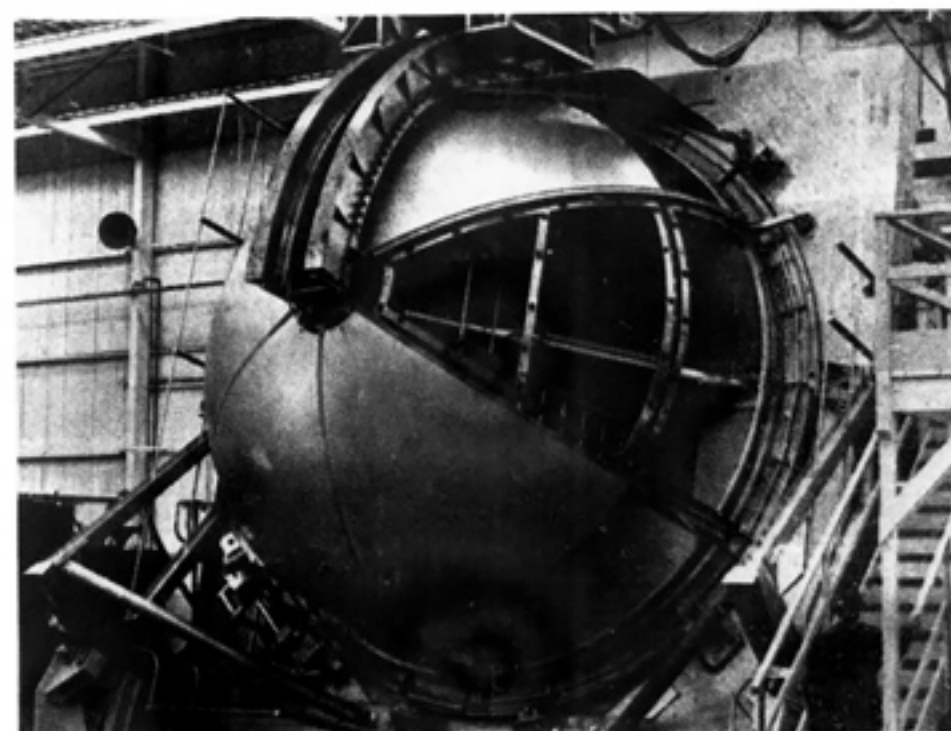


Photo shows tank of S-4 second-stage of the Saturn C-1 which will be powered by hydrogen-fueled J-2 engines. It will be operational in 1964.

### SA-3 SATURN C-1 TEST FLIGHT DATA

Time: 12:45 EST, 16 November 1962. Lift-off weight: 1,086,000 pounds. Propellant weight (RP-1 and LOX): 750,000 pounds, or 130,000 pounds more than in SA-1 and SA-2. Booster diameter: 22' 6". Booster height: 125 ft. Vehicle height with dummy second stage: 162 ft. Burning time: 4 inboard engines 141 sec., 4 outboards 149 sec. Altitude reached: 104 miles. Speed: 4000 mph. Vehicle exploded at ground command: T plus 292 sec. Water ballast released: 95 tons (23,000 gallons).

## Gemini program in danger

Crowded out for five frustrating years by two administrations from having a larger share in NASA's man-in-space program, the U.S. Air Force may finally get in by the budgetary "back door." Plagued by skyrocketing costs of its moon program, NASA is already overspent on fiscal-1963

Mercury/ Gemini/ Apollo manned flight program, and is apparently afraid to ask Congress to up the ante - especially with a whopping \$7.8 billion deficit in the national budget this year.

James E. Webb, Chief of NASA, is publicly saying that NASA funding is not running out. But privately, insiders say, he knows that D. Brainerd Holmes - boss of the Apollo lunar program - is right when he says they are at least \$400 millions short on space money as of now. As a result, work has been seriously slowed down on the vital manned spaceflight program. This caused NASA to suggest cutting down the Gemini schedule from 14

to 6 flights only. The 2-man Gemini series was designed to fill the gap between the 1-man Mercury and 3-man Apollo flights.

The words were hardly out of NASA's mouth when the USAF, brandishing ample space funds (DOD hardly lets them spend it), offered to share the price - at a price. Either give the USAF donor a stronger voice in the manned space-flight program, or sell five Gemini capsules for the Air Force to use as it wishes.

What the final decision will be is unannounced as yet. But indications are that NASA's empty space pockets will give it little choice. All this,

of course, is a monotonous repetition of the civilian space agency's previous space sins ever since its formation in 1958 - inability to estimate true costs of its future programs and a genius for planning "buckshot" projects that spread funds thin, instead of concentrating on a single goal with maximum intensity.

Much of NASA's money troubles, it is said, stem from poor contracting methods, unnecessary back up devices, too many unneeded "development" shots before declaring a vehicle operational, a plethora of "reviewing" committees who look in each project's mouth a dozen times before making a go-go decision, and an unbeatable ability to turn out talkware in far greater quantities than hardware.

The hint of NASA curtailing the Gemini program first brought genuine dismay to the USAF - and for good reasons. They had specifically stated Gemini's goals - perfecting orbital rendezvous and extending



Wernher von Braun

continued on page 2



**SPACE** WORLD

1963



# SPACE WORLD

Vol. 4, No. 1

Second Class Postage Paid At New York, N.Y.

January 1963

## Mariner-2 Reveals Venus Secrets

The dawn sun was just struggling above the horizon at Goldstone Tracking Station in California, that morning of December 14, as the huge 86-foot antenna swung and locked itself with infinite care on an invisible target far off in deep space. A radio command crackled forth. Even at the great speed of 186,270 miles per second, the signals took over 3 minutes to reach their destination.

And with both earth plus its target moving through space, this feat was comparable to hitting clay pigeons with a peashooter at 10,000 yards - beyond the horizon.

Thirty-six million miles away, a tiny man-made craft in the immensity of space picked up the beamed pulsations and signaled back the code for "I read you, Goldstone. Shifting from cruise-mode to encounter-mode. Sensors swinging toward Venus."

The time was 8:35 a.m. (EST), marking an historical SPACE FIRST. After traveling for 109.5 days over a total distance of 180.2 million miles, Mariner-2 had achieved the first operational flyby of a planet, passing within 22,000 miles with all its electronic gadgets humming and its radio blinking. But before calling past, the 42-minute scanning mission had been completed, while the lighting on Venus was most favorable. Here was the sequence in the afternoon of 14 December 1962:

- 1:55 P.M. Scanning begins. Most of Venus dark as Mariner passes below the planet at a distance of 25,262 miles. Probe's speed is 87,000 mph in solar orbit.

- 2:17 P.M. Vehicle passes directly over terminator, Venus half in sunlight, half in dark. Two radiometers continue scanning clouds and surface at rate of 1/10th degree per minute.

- 2:37 P.M. After 42 minutes, examination of Venus ends as Mariner's sensors cannot cope now with full solar radiation on dayside of Venus.

- 2:59:28 P.M. Closest approach of 21,594 miles over planet's bright side. Mariner's speed increased 1400 mph by Venus gravity to a new high of 88,400 mph.

- 3:20 P.M. At command from earth, Mariner returns to cruise-mode. Sensors switch back to charting interplanetary phenomena - solar magnetic field, charged particles from sun, interplanetary dust, and cosmic-ray counts.

- December 27, Mariner reaches its perihelion, or closest point to the sun - 65,505,935 miles.

- 30 March 1963. Maximum distance between Mariner and earth - 98,063,599 miles.

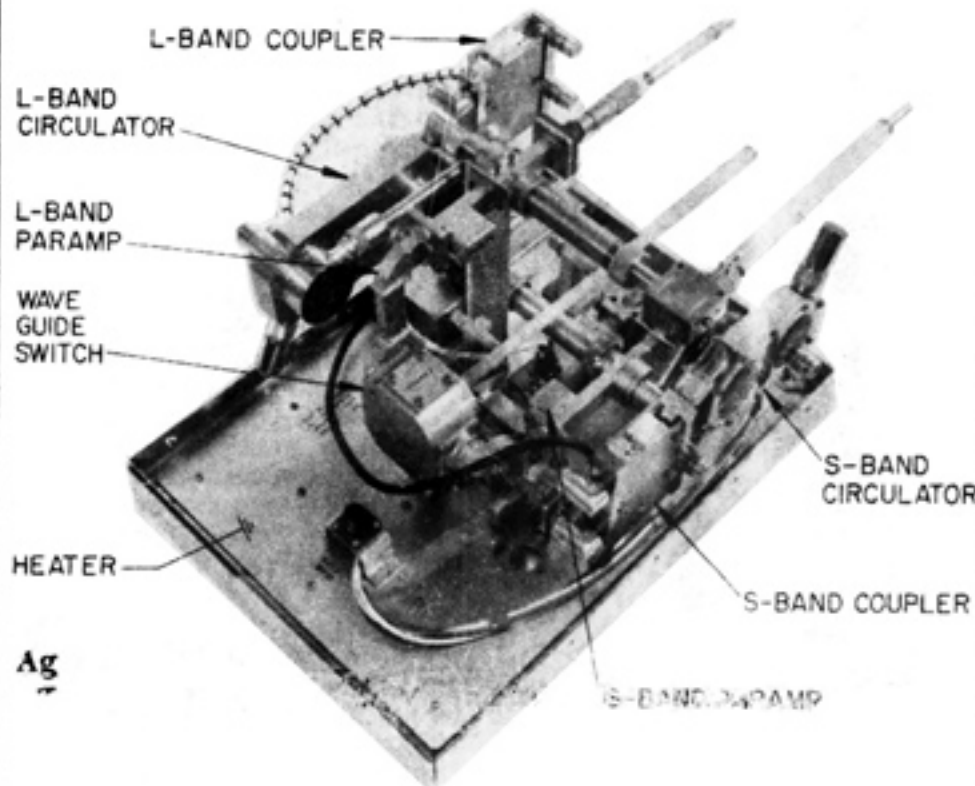
- 18 June 1963. Mariner will reach its aphelion at a distance of 113,813,087 miles from the sun. Since this is some 20 million miles further out than earth goes, Mariner will cross earth's orbit twice during each of its short-year periods of revolution around the sun, taking 345.9 days.

- 27 September 1963. Closest approach to earth - 25,765,717 miles. If Mariner's instrumentation is still working, Goldstone will attempt to make contact and ask for all the data it has accumulated for long months in its lonely journey out of reach of earth's radio receivers.

Scientists at Jet Propulsion Laboratory, which made the probe, were jubilant after all the telemetry code had been safely received and stored on tape for weeks of intense analysis. For a while, during the last month of their hardware's trip, it seemed

cosmic-rays during the trip from earth) sought out any "Van Allen Belt" of radiation which might be coiled around the planet's equator, as on earth.

The whole vehicle was the "instrument" for one side experiment - testing the gravity-pull of Venus, which has previously been estimated roughly at 9/10ths of



Telemetry system shown here receives signals across 36 million miles of space, and represents deepest space penetration in history.

Mariner 2 scientific experiments

Experiments	Description	Experimenters
Microwave radiometer	Determine the temperature of the planet surface and details concerning its atmosphere	Dr. A. H. Barrett, Massachusetts Institute of Technology; D. E. Jones, JPL; Dr. J. Copeland, Army Ordnance Missile Command; Dr. A. E. Lilley, Harvard College Observatory
Infrared radiometer	Determine any fine structure of the cloud layer	Dr. I. D. Kaplan, JPL and University of Nevada; Dr. G. Neugebauer, JPL; Dr. C. Sagan, University of California, Berkeley
Magnetometer	Measure changes in the planetary and interplanetary magnetic fields	P. J. Coleman, NASA; Dr. I. Davis, Caltech; Dr. E. J. Smith, JPL; Dr. C. P. Sonett, NASA

Mariner might not survive its "Perils of Pauline" ordeal, as the ever-nearing sun threatened to overheat the probe and cook its inside instrumentation into silent junk.

But the smoking batteries, transmitters and sensors valiantly held up. Earthly hearts sank twice more when Mariner failed to answer the first two commands to begin scanning the planet. It was rapidly approaching, early on December 14. Sent 3 hours and 20 minutes apart, those two signals failed to start the sequencing timer clock aboard Mariner. Time was drawing short when Goldstone took the third bead on the disobedient probe and finally hit the bull's-eye - the center of Mariner's earth-oriented dish for picking up signals from its absentee masters.

All else that followed was routine, once the ingenious monitoring system began operating through the 42-minute period of flyby observations. The two radiometers took the planet's temperature at two levels - among the clouds and down at the surface. A magnetometer began nosing for any indications of a Venusian magnetic field. Finally, a Geiger counter (which had counted

earth's. The fact that Mariner's trajectory was "bent" about 25 degrees during flyby indicates this approximation is near the truth. But more exact figures will come when the full telemetry data (as to distance and velocity at the time) are interpreted.

Other data expected, which astronomers are eagerly awaiting, will be more accurate figures for the cloudy planet's distance from the sun, its orbital speed, and its mass. Other bonuses may come from Mariner, such as the depth of the Venusian atmosphere, the true albedo (reflecting power) of its dense clouds, and the amount of radiant energy per square foot (solar constant) received from the sun at that distance (67,000,000 miles).

But the answers scientists were most agog over revolved around the possibility of LIFE on our sister world. This depended on several factors - sufficient oxygen in the atmosphere, some water on the planet, and the general surface temperature. On the basis of rough checks of the telemetry data, rushed through before the end of the year, NASA has made a tentative announcement: continued on page 2

## IN THIS ISSUE CREATING A SPACE SUPERMAN MULTI-ENGINE MIRACLE TELSTAR AND RELAY

### OPTIMAN—Future Astronaut Specialist Calls for New Species of Homo Sapiens

Are the Soviet space medicine experts and astro-biologists on a crash program to create a new species of *homo sapiens* - spacemen who are super-strong, radiation proof and possess computer-fast minds?

This was the startling conjecture of Dr. Tobey Freedman at the recent symposium of the American Rocket Society in Los Angeles. A space-medicine specialist for North American Aviation, Inc., Dr. Freedman set the audience buzzing with a speech proclaiming that earth-bound man is an "obsolete model" not suited for the invasion of space. For this, he suggests, we need a "space age mutant" directly "tailored" by bio-astronautics techniques into a true "space" man.

This can be accomplished by the new science of bionics - adapting electronics techniques to biological processes - which has already inserted tiny rocket-type "timer" devices within cardiac pacemakers to keep their hearts beating rhythmically, thus allowing them to leave hospitals and live normal lives. The enormous new knowledge about the human body and brain, coming out of astronaut training and orbital flights, will soon make possible much greater human changes.

The space medic is already hot on the trail of drugs which remarkably improve the resistance of living tissue to deadly radioactive rays of the nuclear-bomb variety. Related drugs will undoubtedly be found that make spacemen almost impervious to killer space radiations such as the Van Allen Belts and solar-flare "death-ray" storms that periodically sweep through space.

Dr. Freedman also predicts that some aspect of bionics - probably an electronic "stimulator" implanted near the brain - can also speed-up human thinking processes to match the super-speed capacity of computers. His method for bestowing super-strength is to produce a "high-compression metabolism" which allows men to draw on enormous bursts of musclepower so that their hands can "twist off the cap of a pickle jar unaided."

Before anyone calls him "Dr. Freedmanstein," let us remember that another experimenter long ago altered Neanderthal Man even more drastically - shoving his chin out, doubling the size of his skull and bulging out his forehead, straightening his bent spine, withering his appendix and tarsal (tail) bone, and removing most of the thick fur-like hair over his body. That experimenter, constantly seeking to improve its imperfect product, was nature (or evolution). Dr. Freedman is simply suggesting that since evolution works much too slowly, we should now put nature's long-range Bio Project (which has never ended) on a crash basis for the invasion of space.

This space medic's daring ideas go even further to where the future spaceman in time will have interchangeable organs and will utilize a "body bank" to "exchange his failing liver the way we change tires after 30,000 miles." Also, at a sort of "human garage" orbiting above earth, he will obtain living finger

extensions "with interchangeable screwdriver ends" in order to carry on his job as a satellite repairman 500 miles above earth.

Dr. Freedman's name for this new "engineered human" is *optiman*, meaning having the optimum qualities for space duties. Year-long trips to Mars wouldn't bother Optiman, who ignores death-dealing radiations his spaceship plows through, computes errors in his course in a split-second, and upon landing at Mars, totes a huge backload when exploring tirelessly for days without sleep.

Optiman is not the first idea for an "improved" man. Some years ago, Manfred Clynes and Nathan Kline, medical researchers at Rockland State Hospital of New York, envisioned Cyborg Man - from CYBernetics (computer principle) and ORGANISM - who through advanced bionic techniques would even be able to exist in a wide range of temperatures, 200 degrees below or above zero, with equal aplomb. Furthermore, in a state of semi-hibernation, his slowed-down body processes would only require one breath of oxygen each day, and no food or water for a whole year. Obviously, a Cyborg crew of astronauts would be ideal for long trips of 5 or 10 years to the outermost planets.

Other proposed variations of these beyond-human astronauts include the following alterations in the age-old physiology of the human organism, in order to let them conquer space fearlessly, painlessly, and almost deathlessly.

- \* Deep-freezing the spaceman's body into complete suspended animation, yet keeping his mind alive with suitable electronics stimuli and/or "psychic drugs" (anti-depressants).

- \* Giving him super-sensitive eyes able to "see" infra-red and ultra-violet rays, thus extending his sight to equal a dozen scientific instruments and eliminate lugging them along into space.

- \* Giving him brand-new senses beyond the traditional five, so that this astro-man can "feel" magnetic fields, hear radio-waves directly by ear, and "smell" radiations so that a strong rav odor would warn him of Janger from invisible death.

- \* Find and stimulate his ESP (Extra Sensory Perception) mechanism so that when exploring another planet he could maintain blackout-proof contact with his fellow spacemen via "thought-wave" messages.

- \* Colonists on other planets - such as Mars - to be bionically adapted for breathing the thin air without artificial tanks and helmets, also immunized against poison or suffocating gases they would meet on Jupiter, hydrogen, methane and ammonia.

Will some or most of these changes come about? And how soon? The first answer is undoubtedly yes to some degree, but the second answer cannot be reduced to any continued on page 2



# SPACE WORLD

VOL. 4, NO. 2

Second Class Postage Paid At New York, N. Y.

FEBRUARY, MARCH 1963

**\$50,000,000,000,000 FROM THE ASTEROIDS**

## ***Most startling report of the Space Age answers critics of our Space Budget***

by DANDRIDGE M. COLE

Abstracted from Institute of Astronautical Sciences.

### **Introduction**

THE ASTEROIDS HAVE suffered in the past from competition for the astronomer's attention by the distant stars and galaxies and more recently by the new intense interest in the moon and the planets. But interest in these fascinating objects can be expected to increase rapidly as we begin to realize the capabilities of our near future astronautical technology and the importance of the asteroids to space exploration and to pure science.

The cis-Martian or close-approach group of asteroids have been little more than curiosities up to the present time. To some astronomers they have been largely a nuisance and astronomers in general have devoted little effort toward gaining more information about these remarkable objects.

Actually almost no firm data is available for any of these small asteroids except their orbit characteristics. The firm data comprises orbit characteristics known with varying accuracy for points of light of varying intensities. Diameters have been estimated on the basis of brightness and assumed albedos. However, since the compositions are not known, the albedo estimates could be grossly inaccurate.

Masses can be estimated from the assigned volumes if densities are assumed. But again some basic assumption must be made regarding composition, and there is no direct evidence to support any particular theory of the chemical structure of these objects.

Astronomers have estimated that there may be thousands of these objects in this size range in this type of orbit. Much smaller objects down to perhaps 100 feet in diameter with a mass of approximately a billion pounds, could number in the hundreds of thousands.

Such objects would be negligibly small by astronomical standards and have thus been of little interest to astronomers. However, by astronautical standards (payloads carried to escape velocity) they are enormously large and should be of great interest to space explorers.

It has generally been believed that asteroids are similar in composition to the iron or the stony meteorites or perhaps that both types are represented in the asteroid belt. Opik,

This special supplement of SPACE WORLD is devoted to what the editors believe is the most SIGNIFICANT ASTRONAUTICAL CONCEPT that has been devised since the Space Age began.

From a brilliant member of the Advanced Space Science Research Facilities of General Electric's Missile & Space Division comes a truly tremendous futuristic insight, which can revolutionize our present-day attitudes toward space — and its seemingly burdensome costs.

Based on solid astro-engineering technology, this space scientist's unchallengeable data prove with little doubt that opponents of an expanded space program—whether in academic circles, industrial firms, or Congress—are as short-sighted as anti-Columbus critics would have been in 1492. Here, in realistic economic terms, is the manner in which our space dollars will come back to us a thousandfold.

This extraordinary report presented by SPACE WORLD foretells the GREAT "GOLD RUSH" OF THE ASTEROIDS — not in the 21st century, not in the next generation — BUT WITHIN OUR LIFETIMES.

IMPORTANT: This special issue of SPACE WORLD is being sent as an extra bonus only to our subscribers. It does not count as part of your subscription. Your subscription will be automatically extended for one month so that you will get your full allotment of the regular issues of SPACE WORLD.



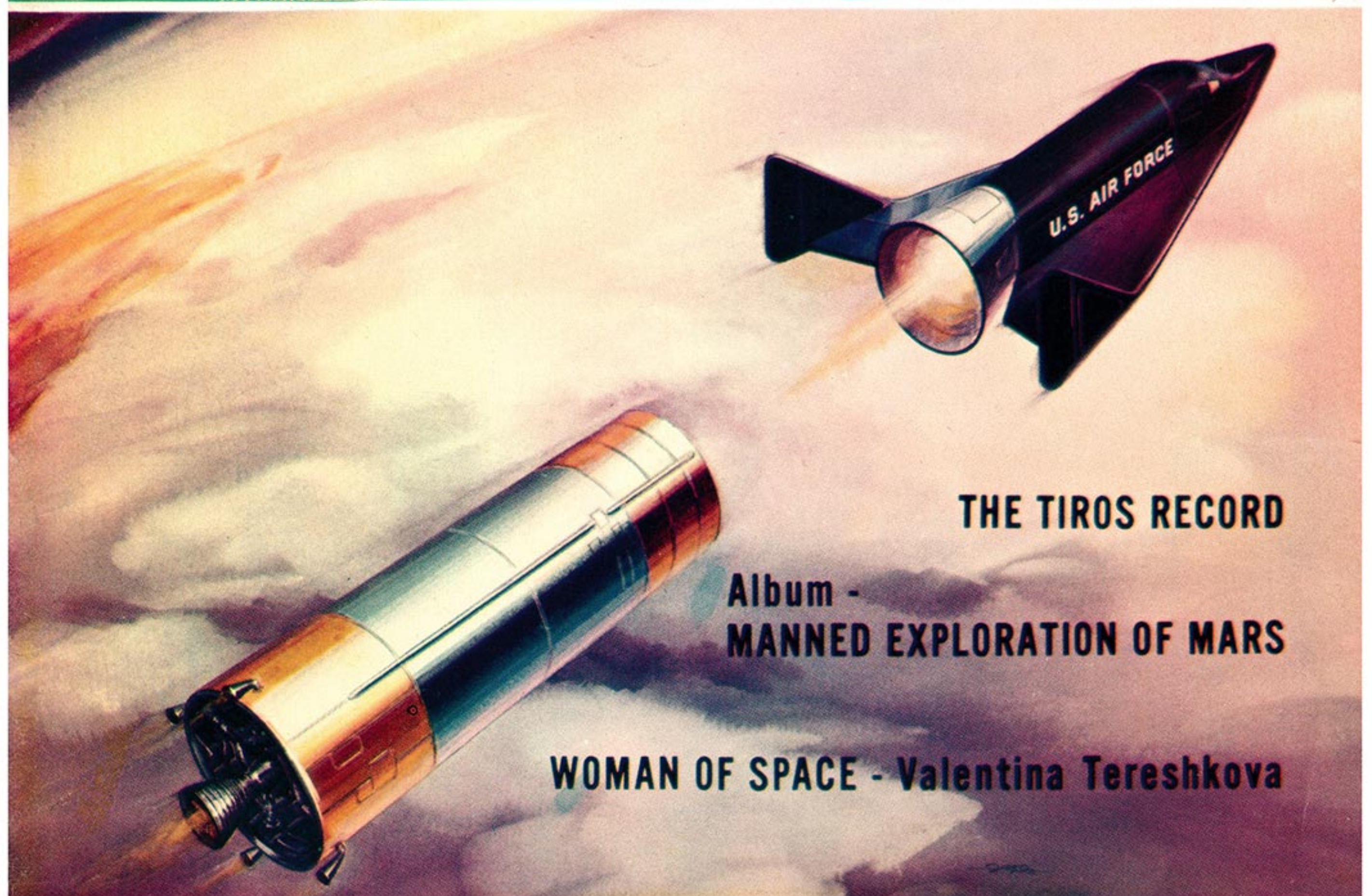
# SPACE WORLD

WISCO

The magazine of space news

Sept.-Oct. 1963

50¢



**THE TIROS RECORD**

**Album -  
MANNED EXPLORATION OF MARS**

**WOMAN OF SPACE - Valentina Tereshkova**

\*NOTE: The September/October 1963 Space World was the first issue published by Ray Palmer.



## *a Promise*

The purpose of the printed word, or of a magazine as a whole, is to convey a message. The magazine preserves this message as a historical record for the ages. The message has to be one of value and of interest to the subscriber or the magazine will disappear from the scene. The publishers of Space World do not wish the magazine to disappear from the scene.

To grow ever larger and better (re-emphasizing the words of the publisher) we want to put into Space World the items and features of interest to you. This we will do. So, don't be bashful about writing to us and making your desires known.

Naturally, every editor has certain aims and ideas of his own. However, I shall try not to inject too much of my own character and personality into your magazine.

We intend to present the facts, without embellishment, about the happenings in the space world that will affect the lives of each of us.

We intend to recognize history, whether it be of today or whether it be from the past, if its impact is still felt in America's space program.

We intend to use many pictures in Space World. We too agree with the wise old saying that one picture is worth 10,000 words. This will be in addition to the special album in each edition.

We intend to recognize all the sciences. The biology of space is as important for manned space flight as the physics or mathematics of propelling spacecraft into outer space.

We intend to progress steadily to better quality, full-color photos, and a larger magazine.

With dedication to these aims, I feel that we can give you a magazine that you will like and one of which we will be proud.

Francis Bremmer  
Editor

★★★

# IMPORTANT INFORMATION for SUBSCRIBERS to SPACE WORLD

SPACE WORLD has a new owner! With this issue, dated SEPTEMBER-OCTOBER, a new and rejuvenated magazine comes to you. We're back to full-color covers, we've got a special photo-section for collectors, we've got top articles, and top features. But most of all, we want to ask you just one important question: What do you want in future issues of SPACE WORLD? The new editor is a top man in his field, a science professor, and he is willing to give you anything you ask for - so please write him and let him know! Make your suggestions with the full knowledge that this is YOUR magazine, and it's being put out for you!

When you subscribed to this magazine, you paid your money to the former owners. When we bought the magazine, we bought your subscription too, and we intend to deliver every issue you have coming, no matter who got the money. In short, you can't lose! Your subscription will be extended for the months in which publication was missed, and you'll get SPACE WORLD until the number of issues subscribed for have been delivered. By that time we feel sure you'll have discovered that this is the best space magazine you've ever seen, and you won't miss a minute in renewing your subscription.

The last issue you received was dated March, 1963, and was not a regular issue of the maga-

zine. From now on, you'll get full-size magazines, and every issue will improve, we promise. There were no issues between March and September. As for the September-October dating, we've got to condense for this year, to prepare for the big job of putting out the magazine monthly. We think we'll hit that schedule with the November issue; anyway we'll try. But with January for sure!

Lastly, allow us to introduce ourselves. We are Palmer Publications, Inc., we call Amherst, Wisconsin our home, we do our own printing and distributing, we have an extremely capable staff (as listed on the contents page) and we are, like yourselves, space fans of the most dedicated type. Your publisher, Ray Palmer, began writing about space and satellites and astronauts (in science fiction) way back in 1929 when he and Willy Ley and Fritz Von Opel belonged to the German rocket club, Verein fur Rhaumschiffahrt. We're pioneers in the rocket field, so we know what we're doing!

This isn't the only magazine we publish: we also put out SEARCH (occult), FLYING SAUCERS (just what its name implies), THE HIDDEN WORLD, (science fiction), INSPIRED NOVELS (great novels of the past). And we're mighty pleased to meet you!

The "gang" at SPACE WORLD.



# SPACE WORLD

Nov.-Dec. 1963

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The magazine of space news

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## CAN MAN SURVIVE IN SPACE?

MEDICAL ASPECTS  
OF SPACE FLIGHT

## THE REALM OF SUPER COLD

"Cryogenics"

## NUCLEAR PROPULSION

How It Will Work

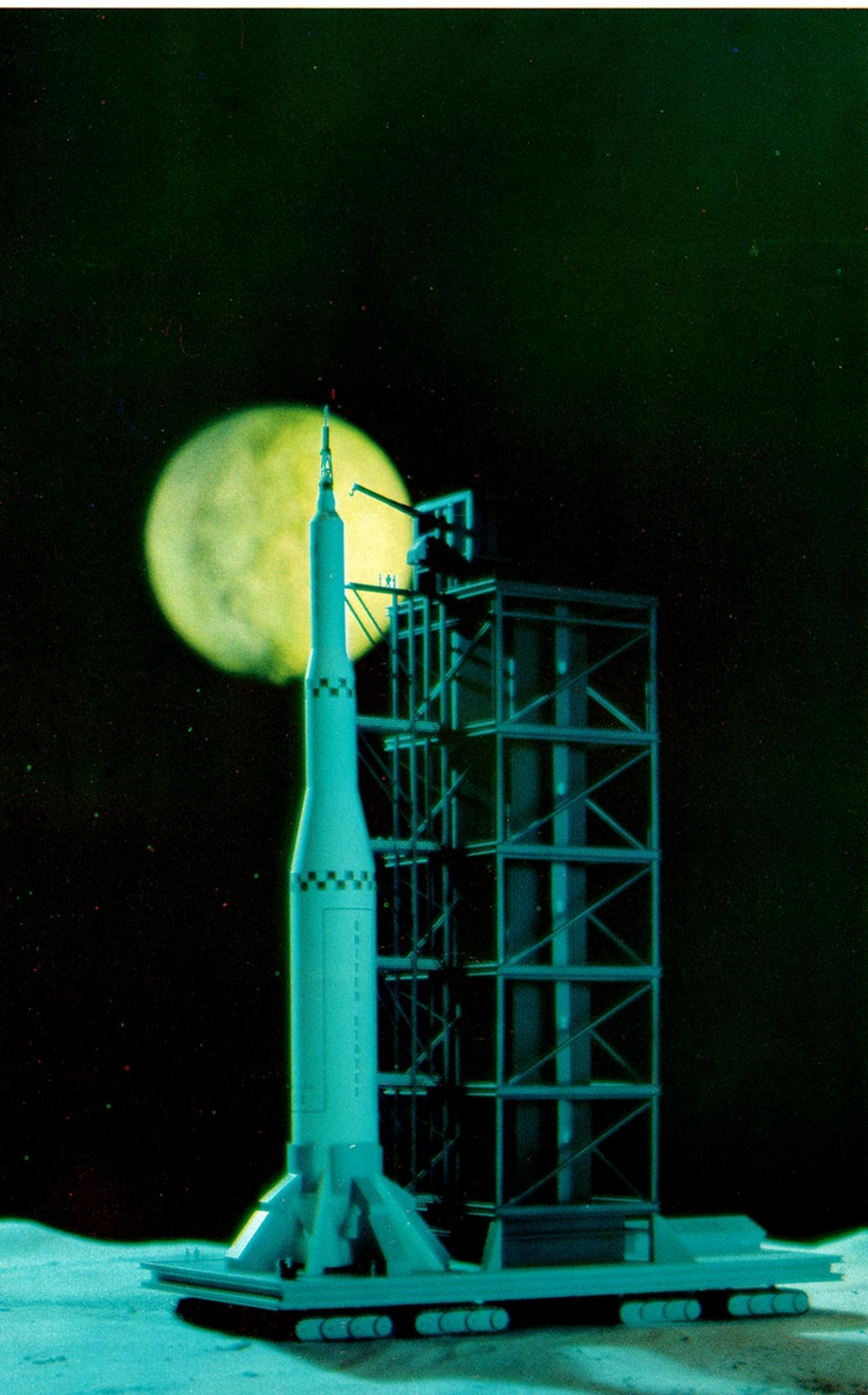
## Do-it-Yourself SPACE LAUNCH VEHICLE

## GENERATING ELECTRIC POWER IN SPACE

"Magnetohydrodynamics"

## SPACE SUITS

## ALBUM: X-20 HOW IT FLIES





**SPACE** WORLD

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GEMINI —

Chronology

Mercury Experience Applied

The Gemini Launch Vehicle -

Titan II

LUNAR EXCURSION

POWER FROM WASTE

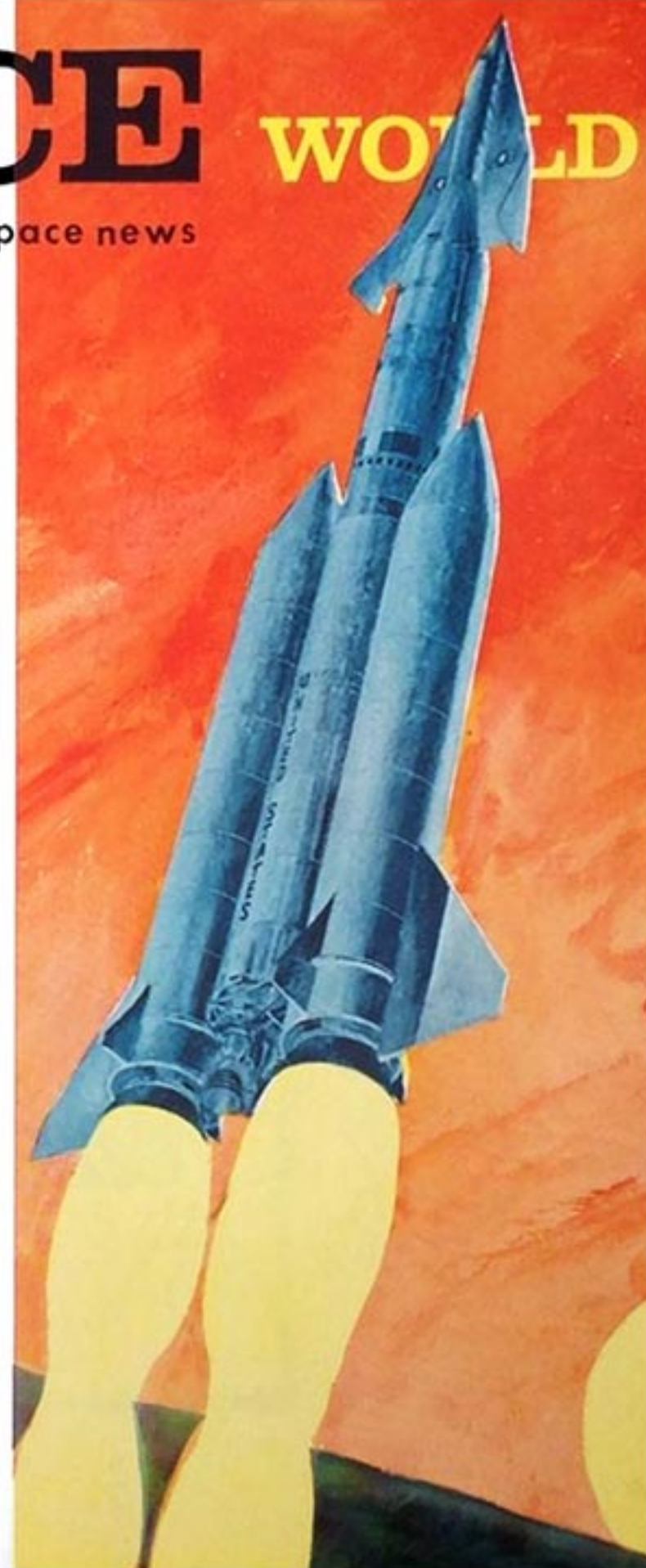
PHOTOGRAPHY IN  
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Summarized



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ECHO II

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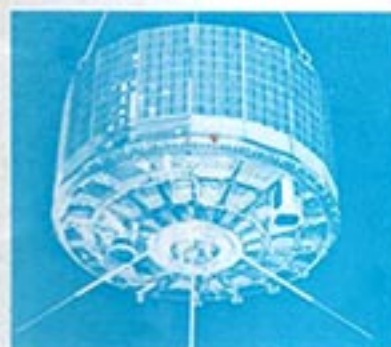
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ATOMIC IMP



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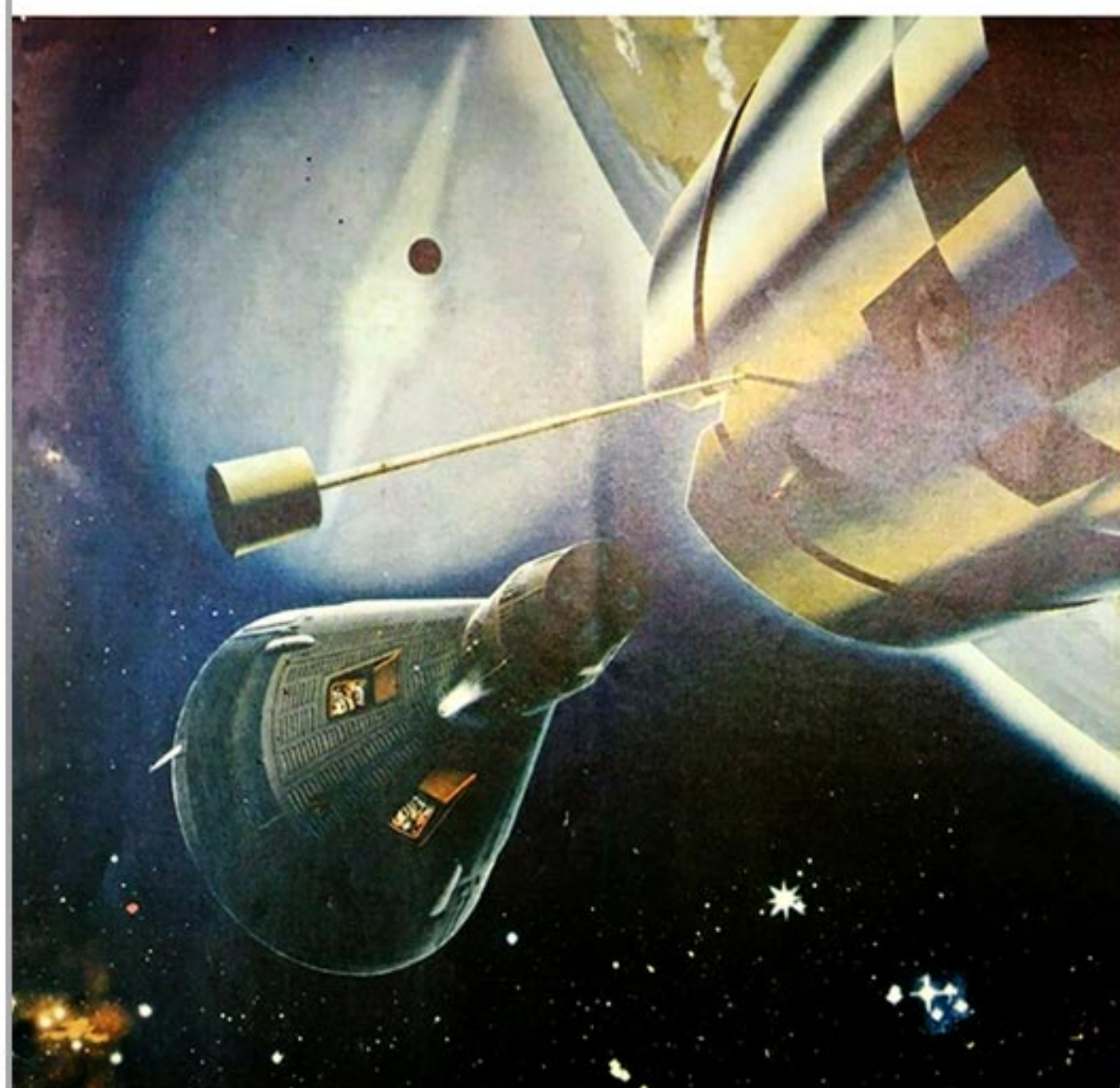


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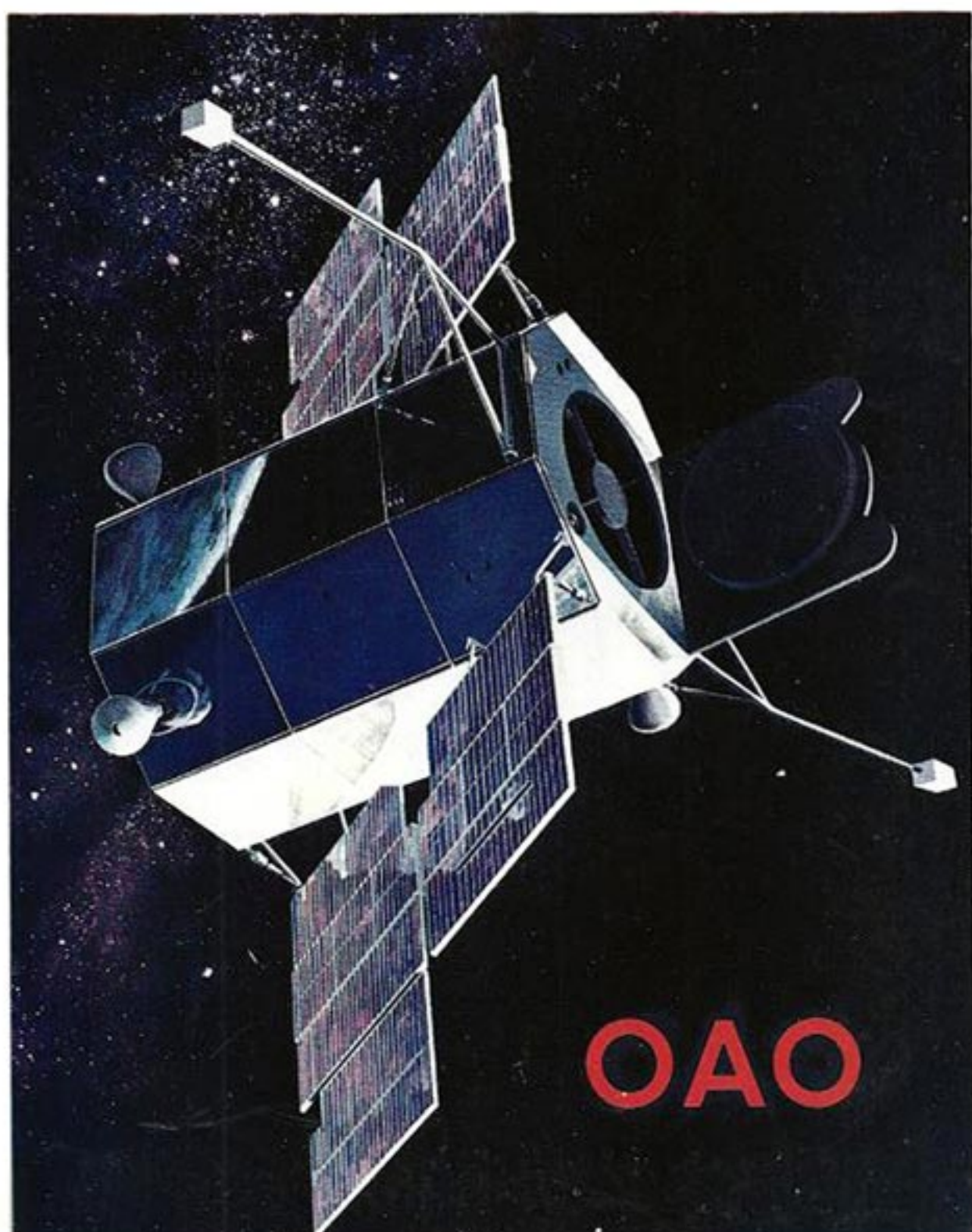


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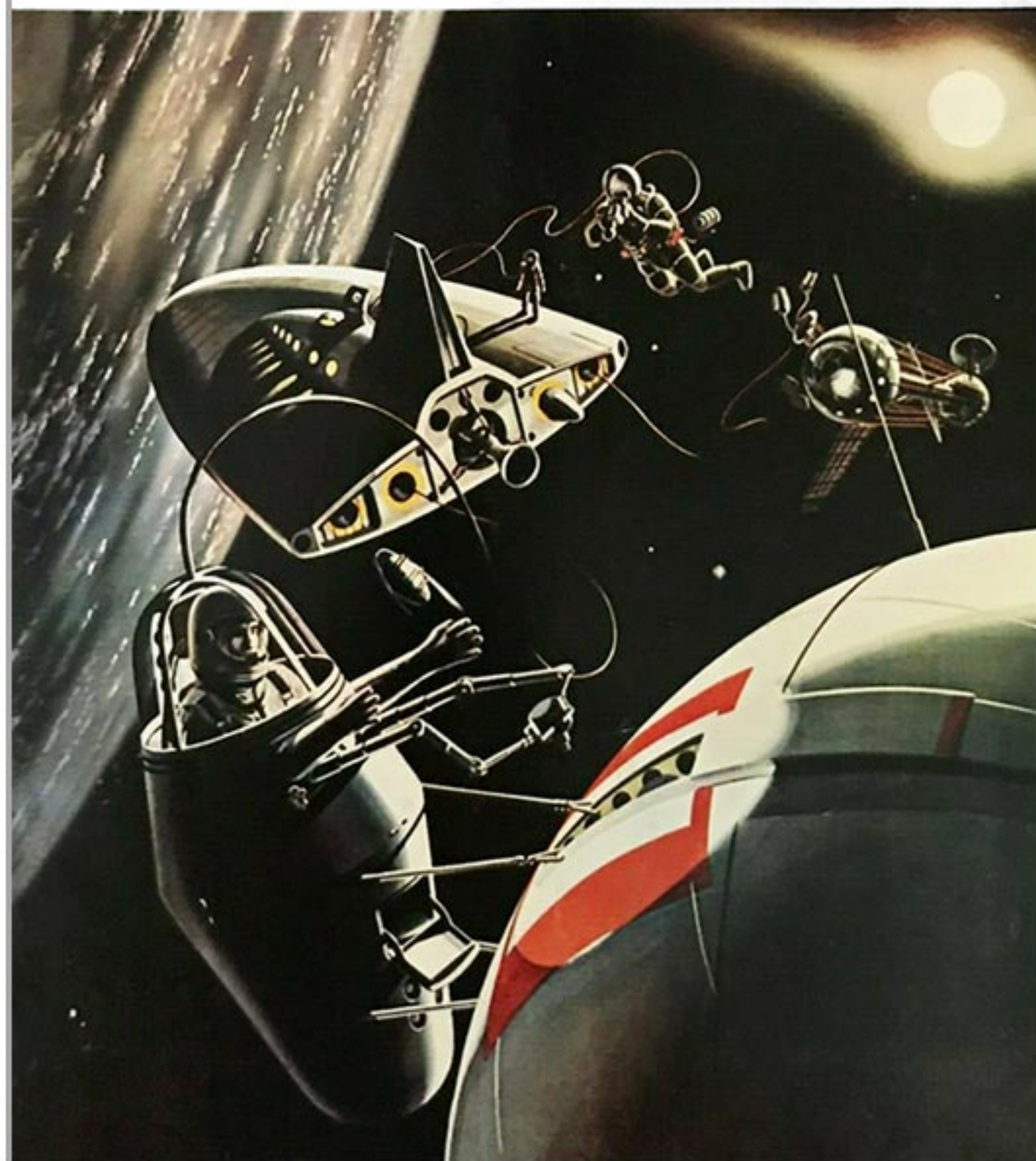
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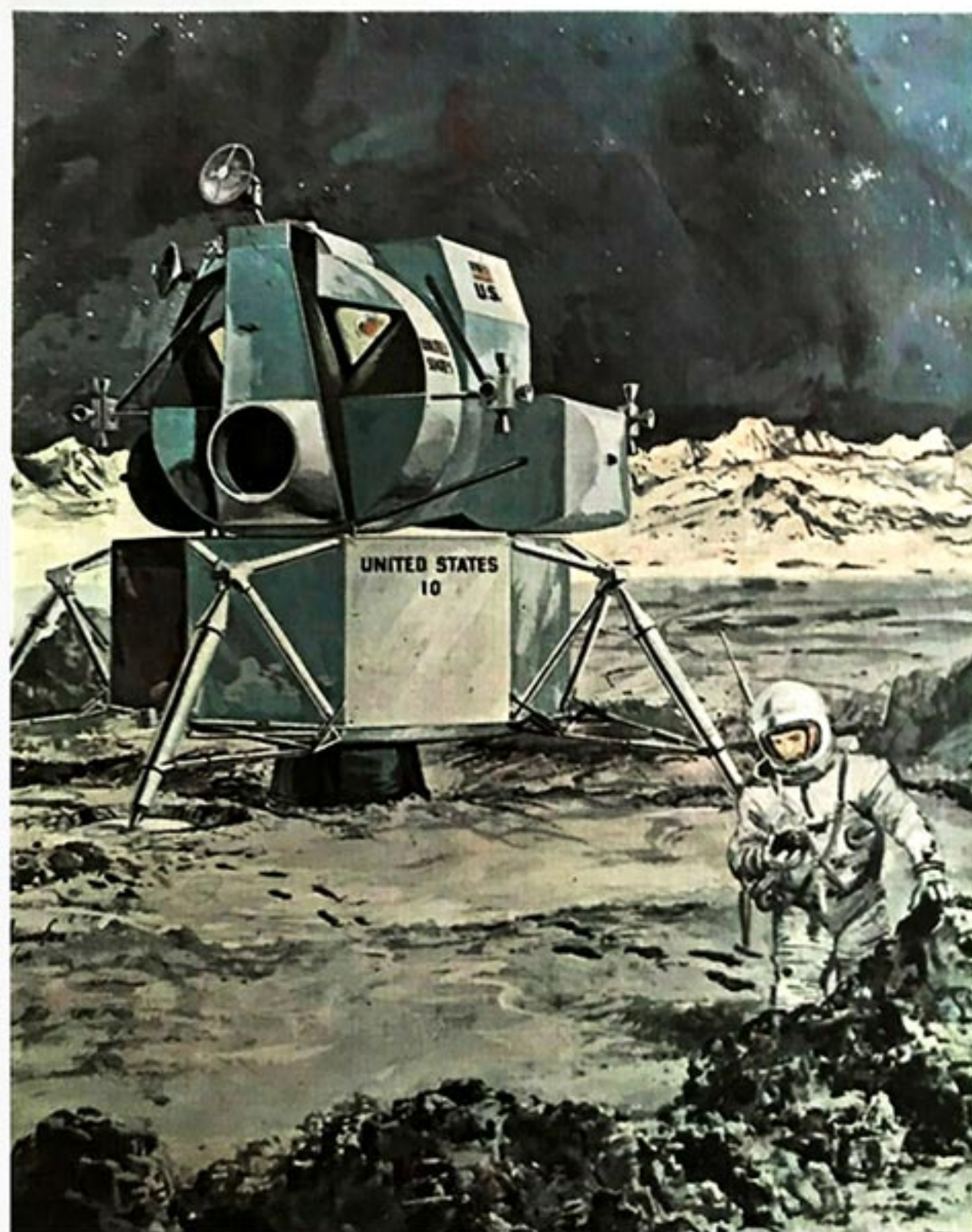
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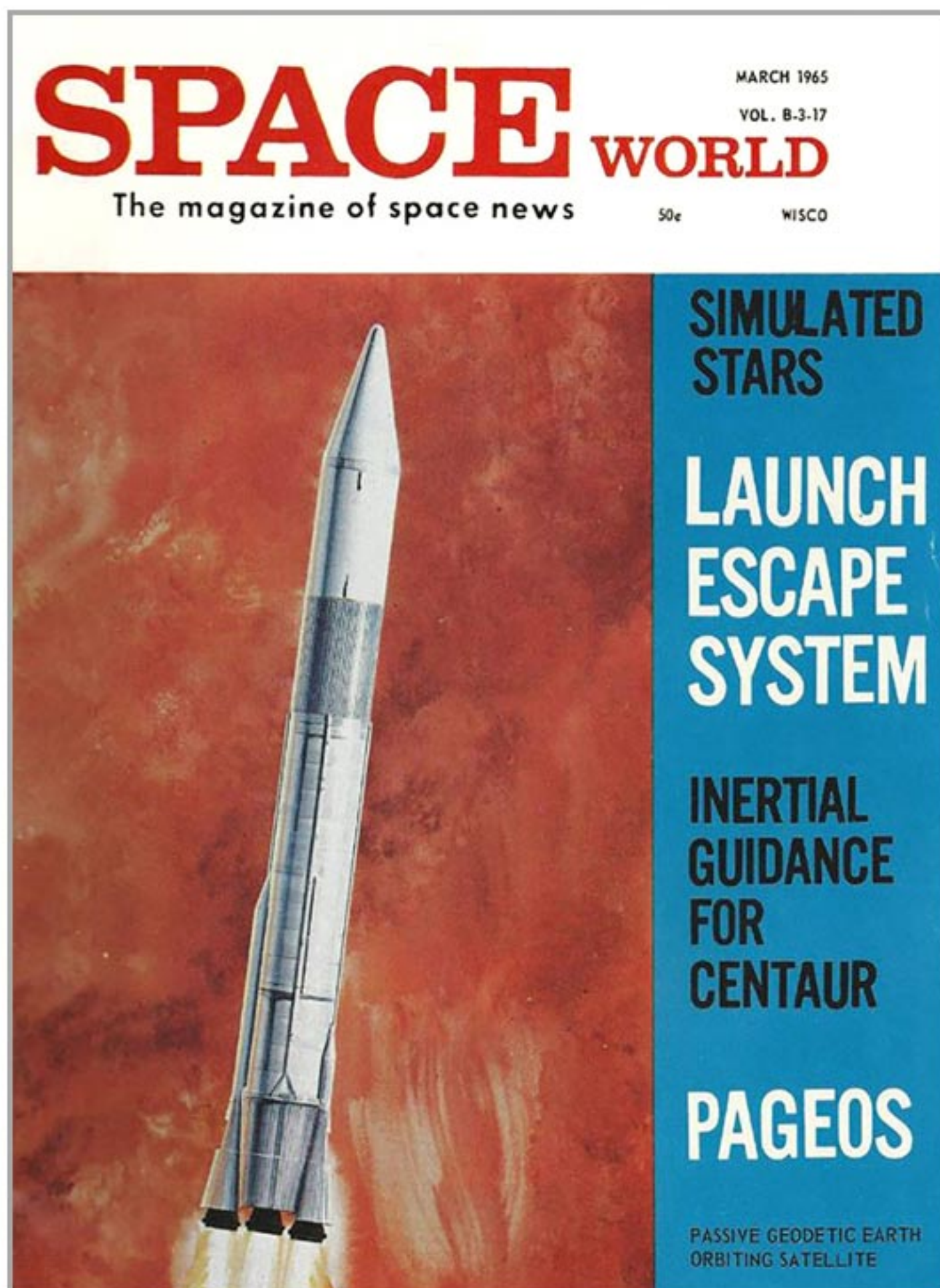
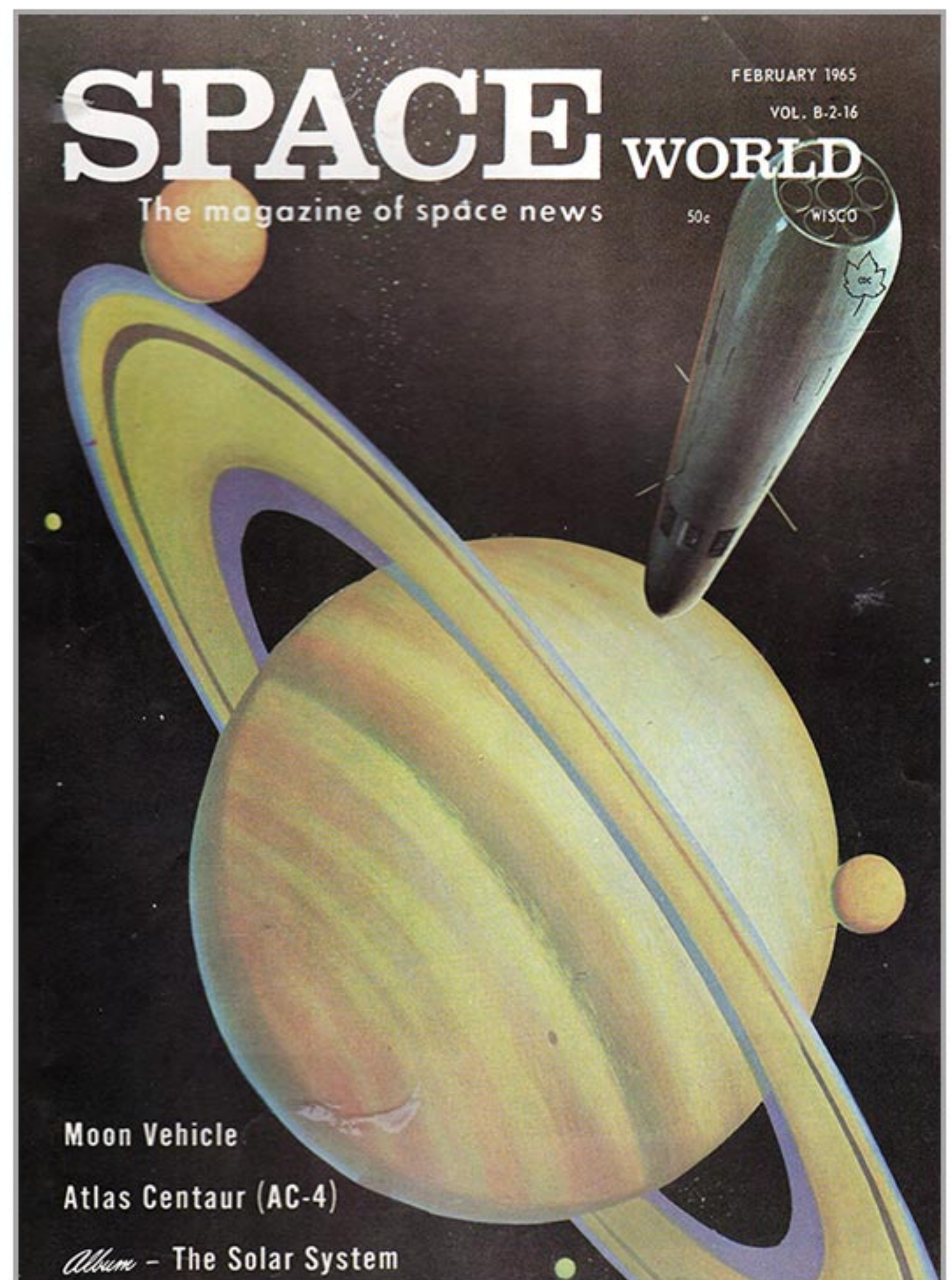




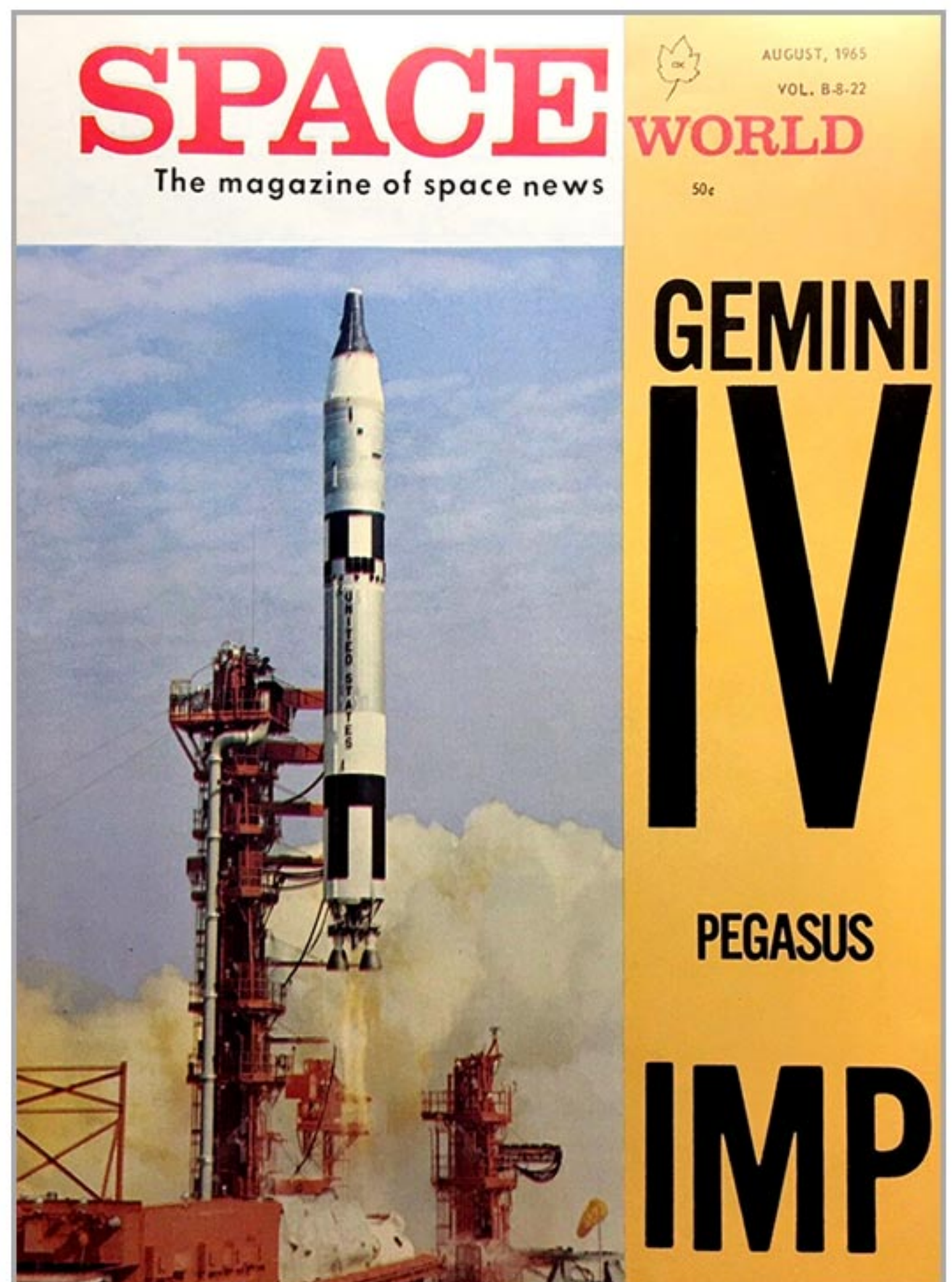
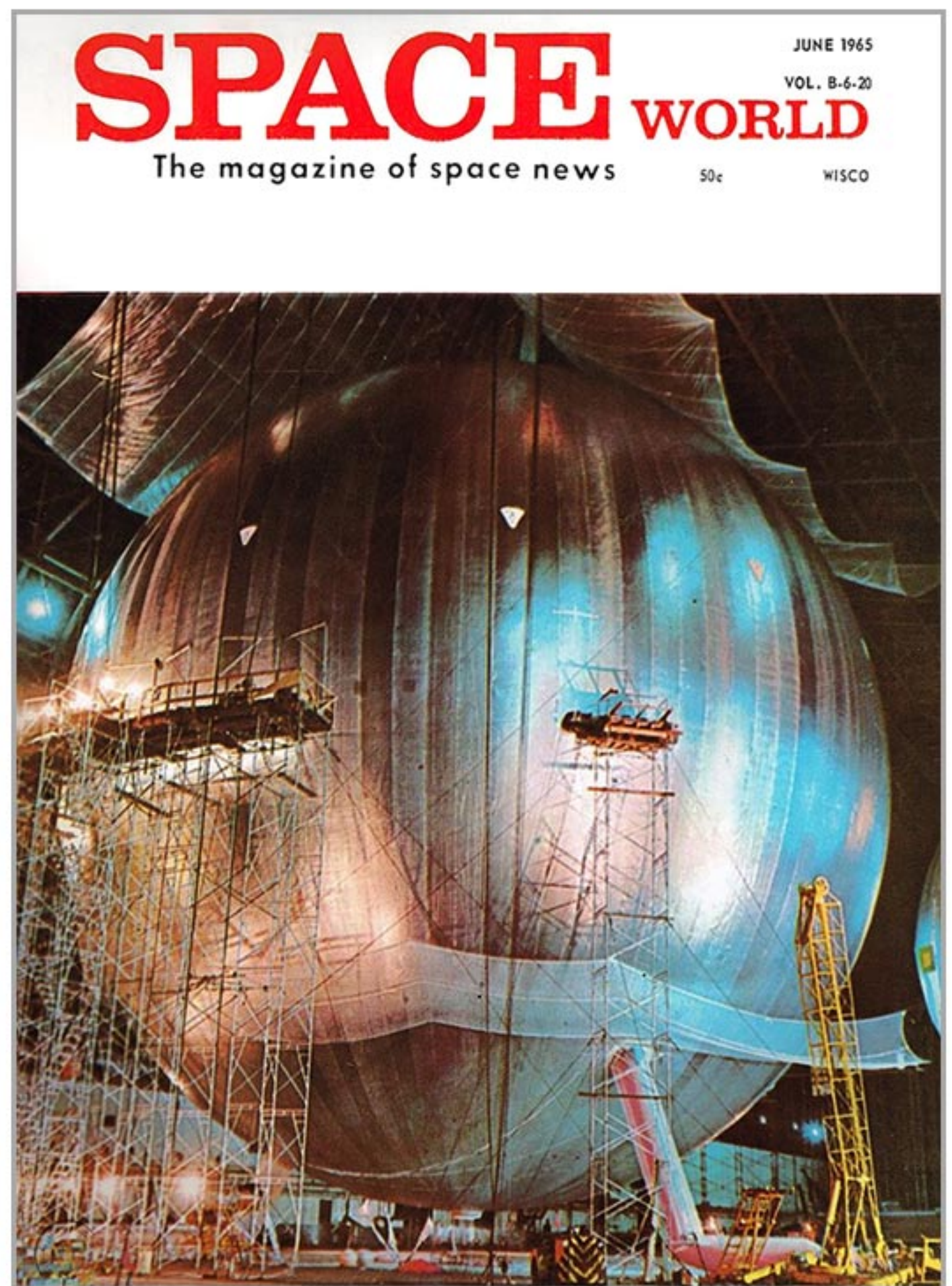
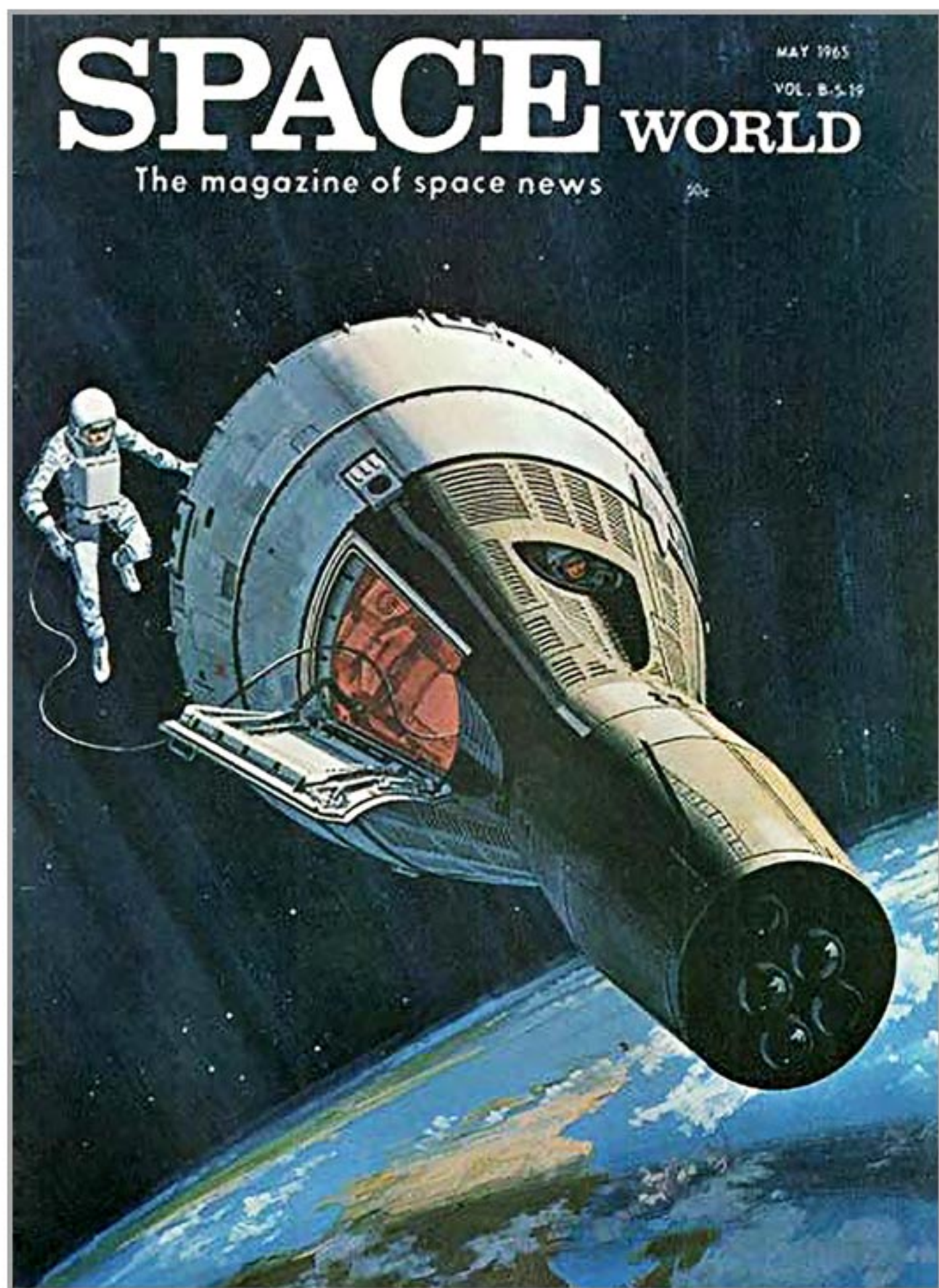
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1965

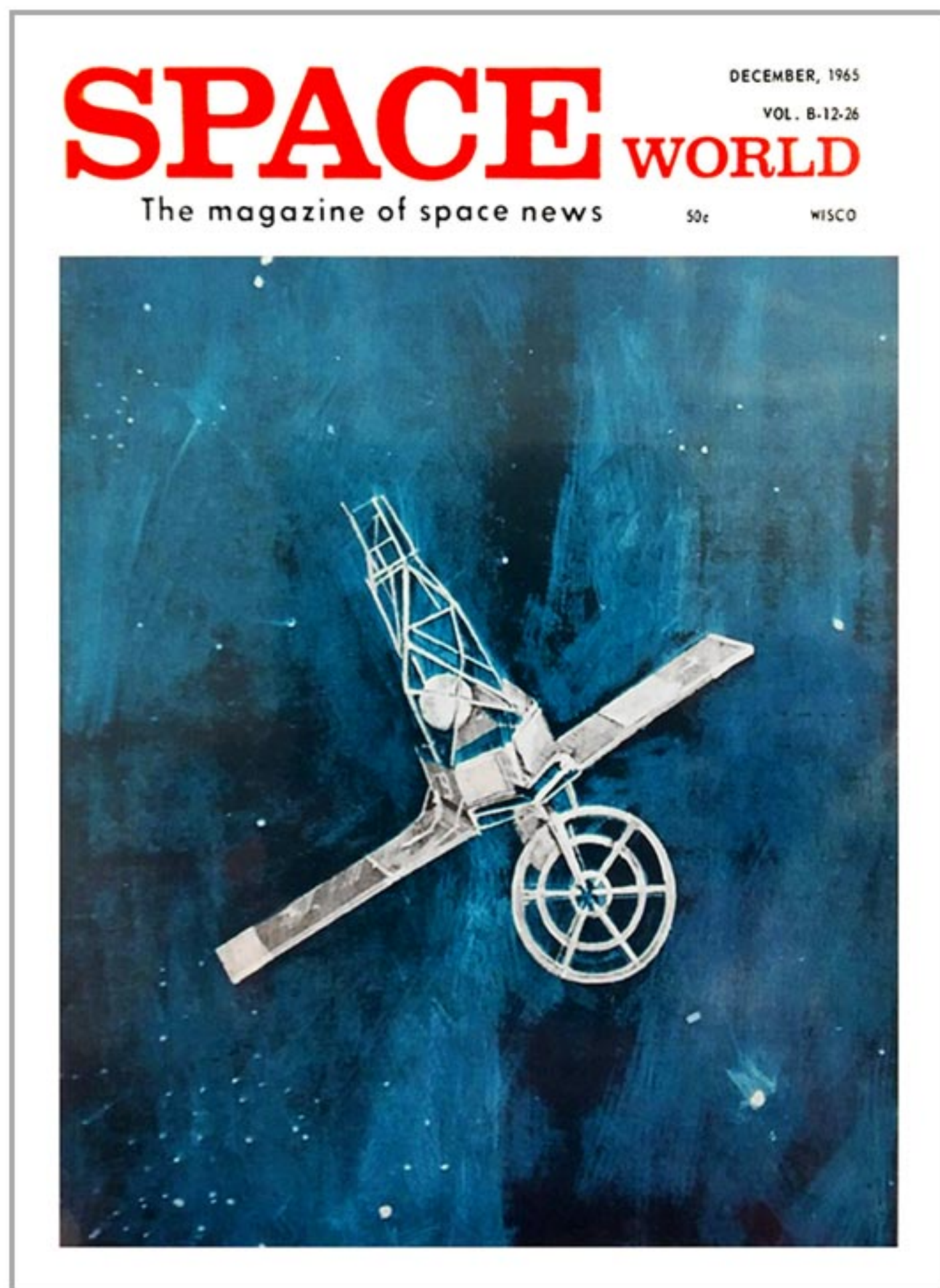
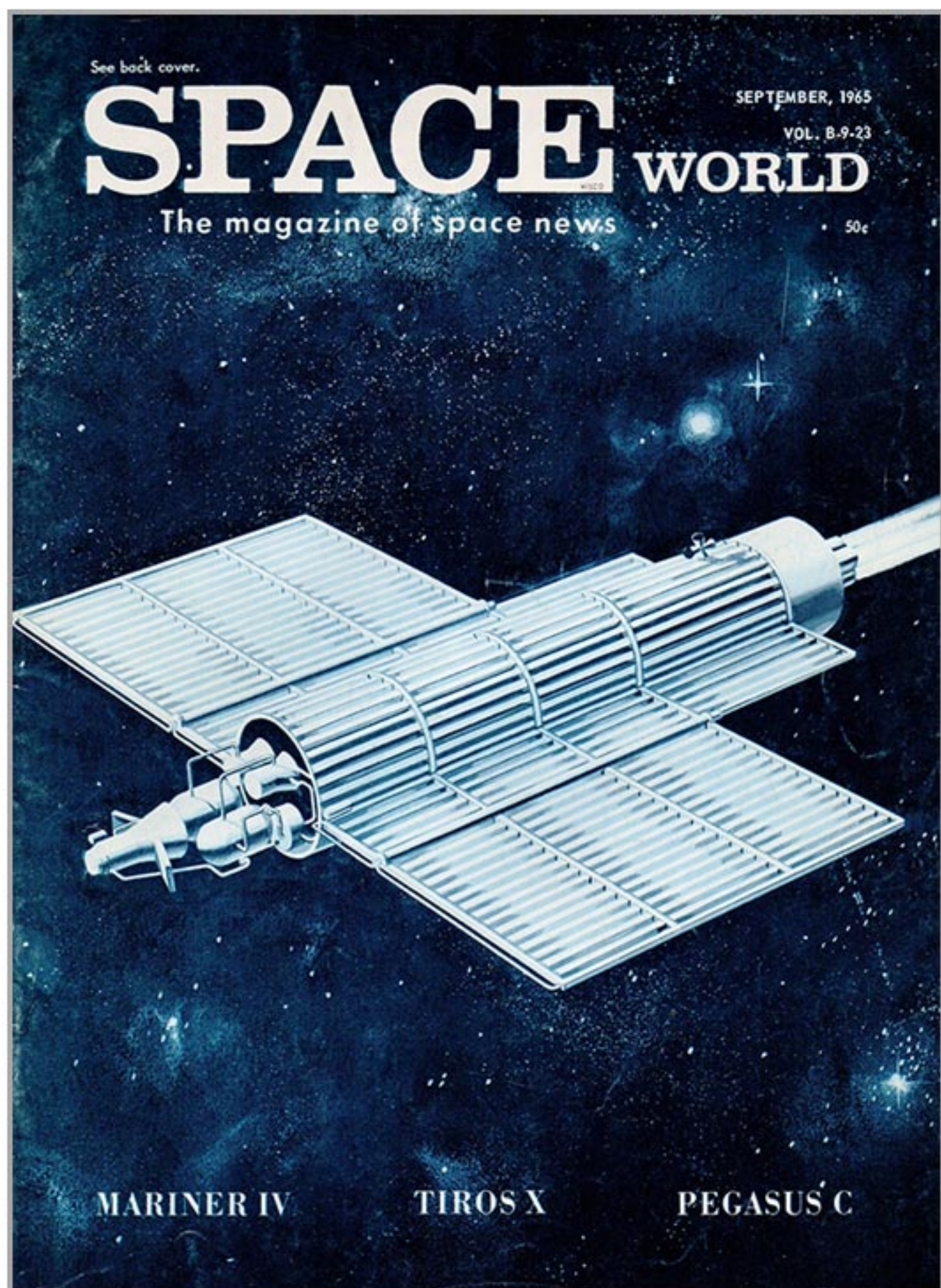










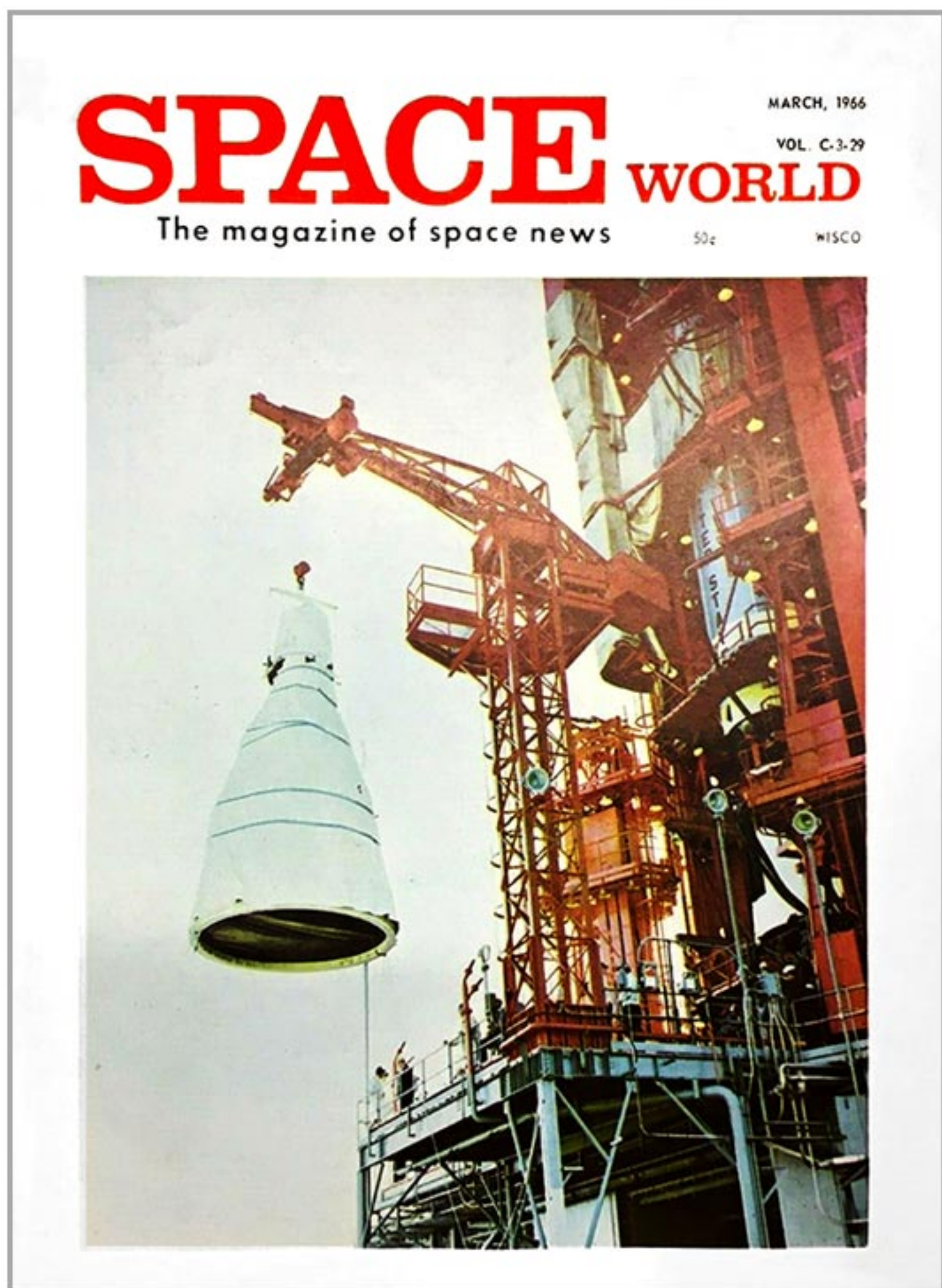
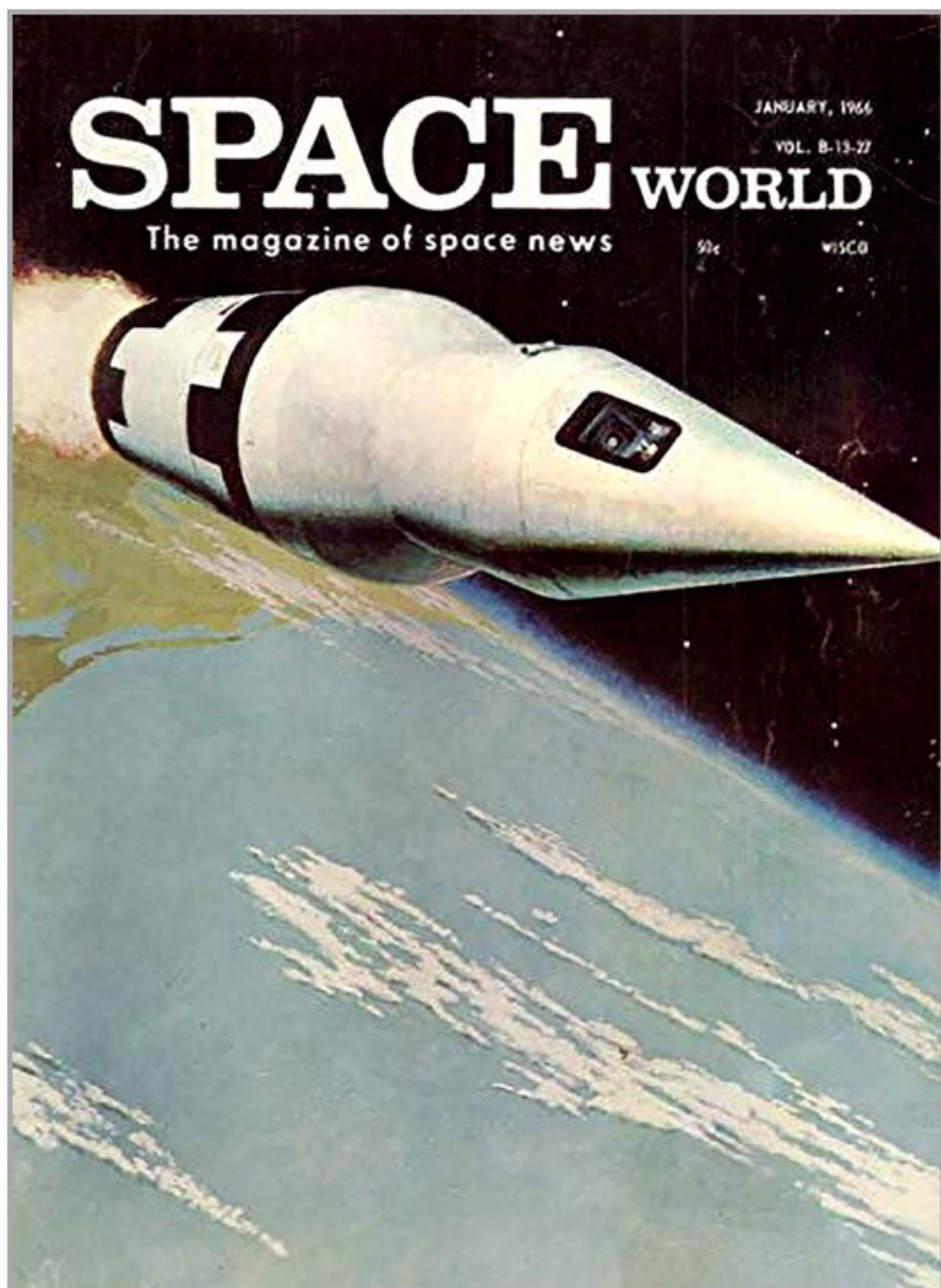




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1966







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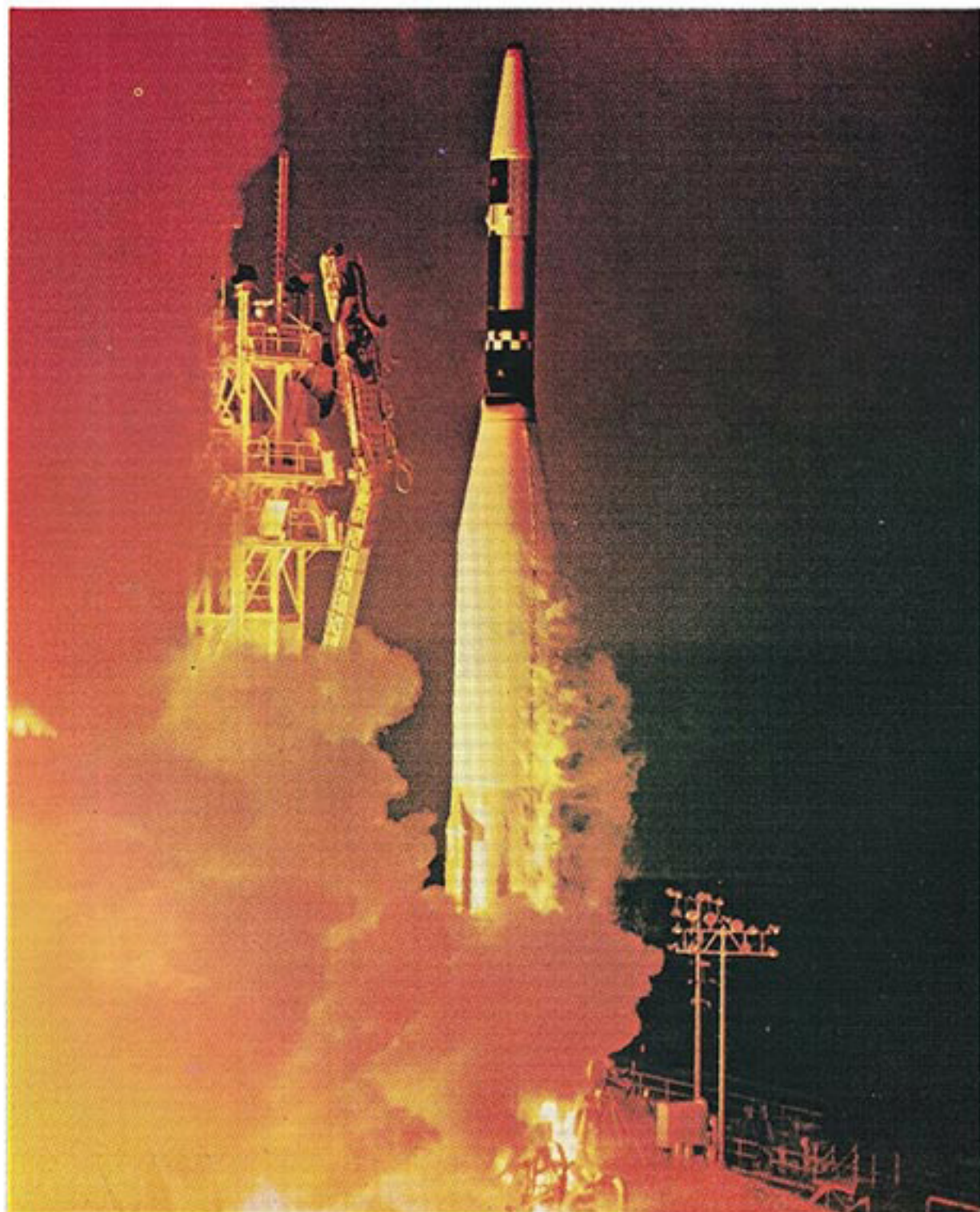
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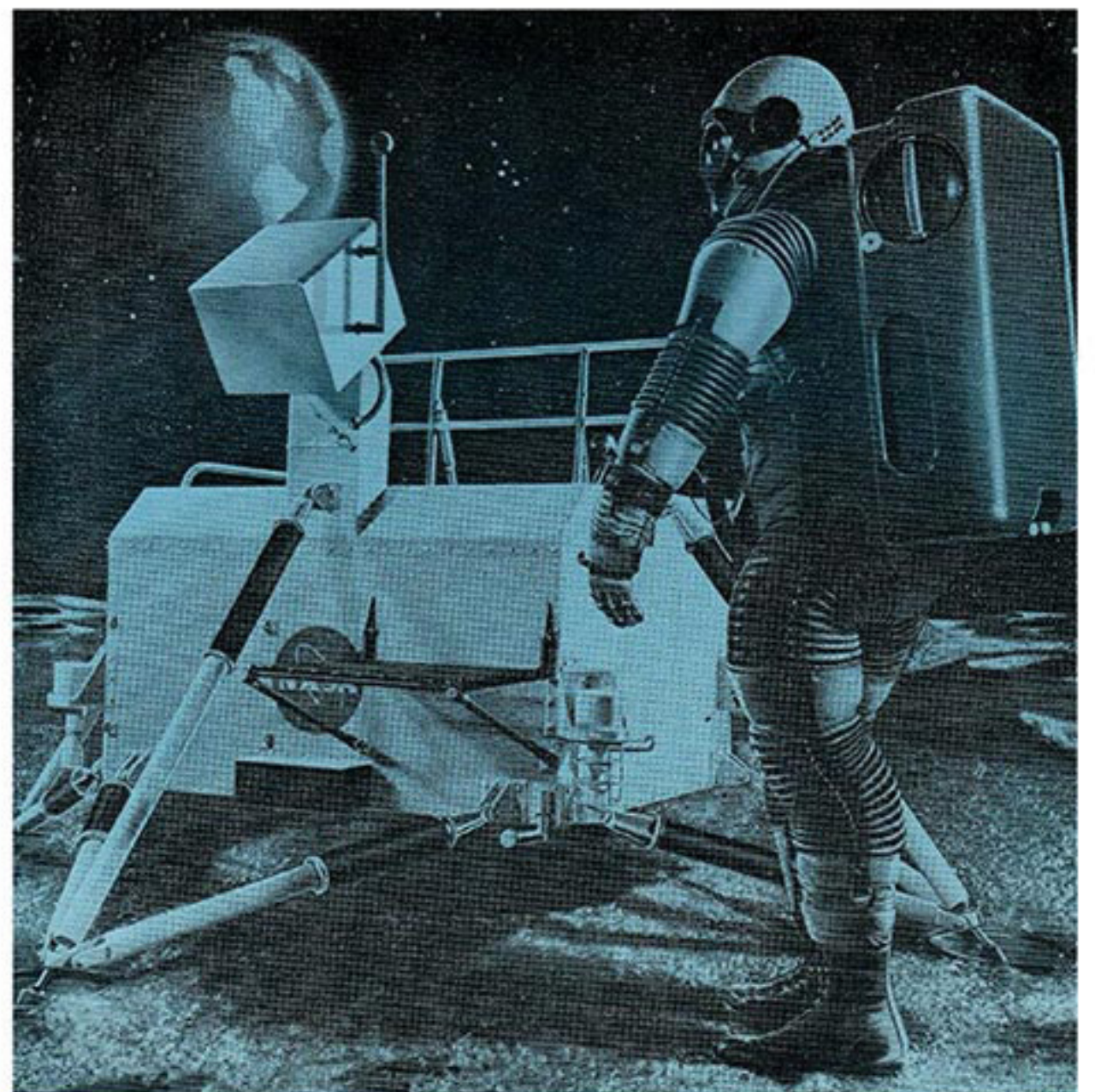
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ORBITAL VEHICLE ONE - OVI-4 and OVI-5

GLOBAL DEFENSE COMMUNICATIONS

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This was determined by checking  
the volume numbers.

(four months either side)

March 1966, Vol. C-3-29

April 1966, Vol. C-4-30

May 1966, Vol. C-5-31

June 1966, Vol. C-6-32

-

September 1966, Vol. C-7-33

October 1966, Vol. C-8-34

November 1966, Vol. C-9-35

December 1966, Vol. C-10-36

The volume numbers run in sequence  
without the July and August 1966 issues.

There was no  
Space World  
August 1966 issued



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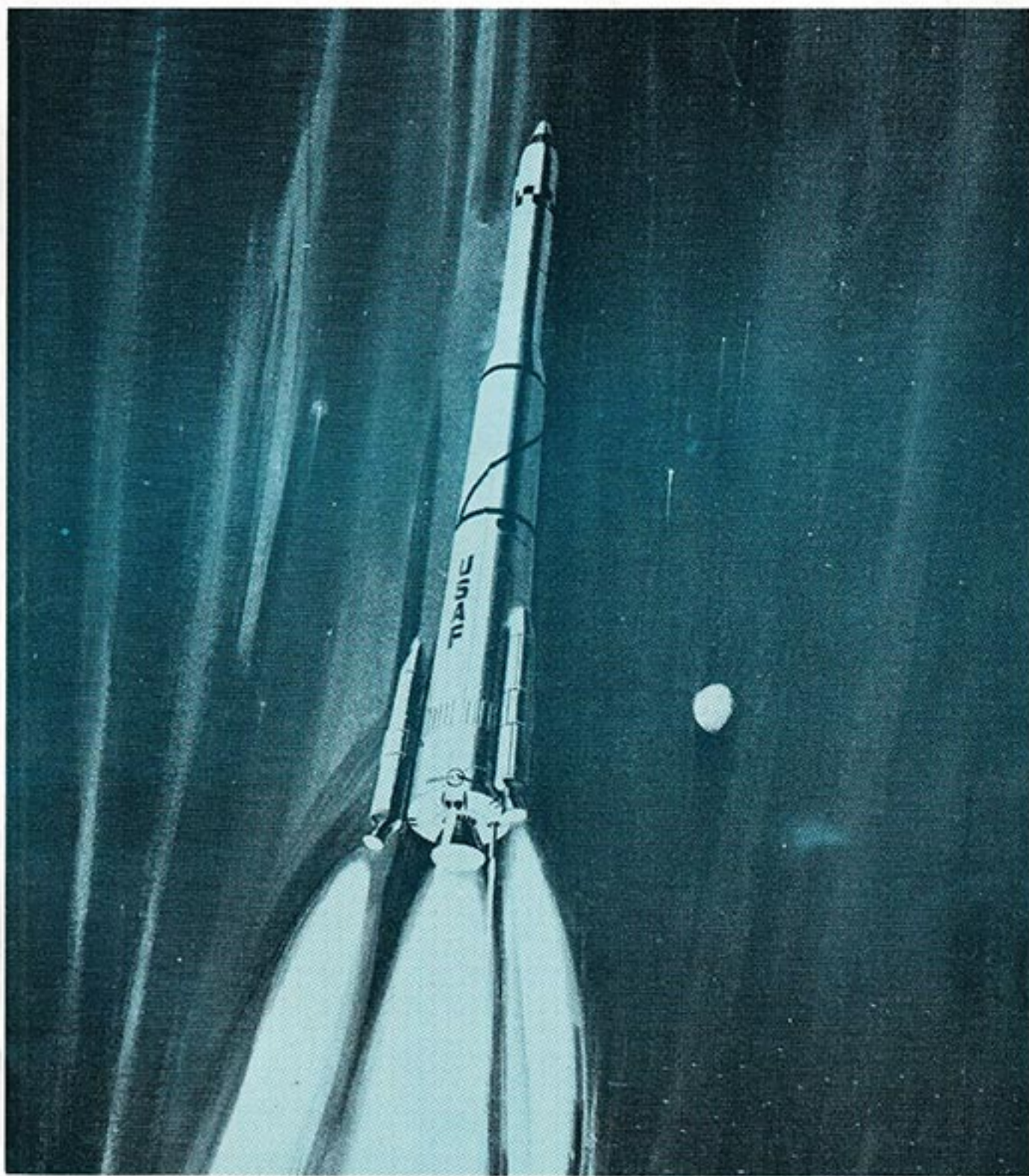


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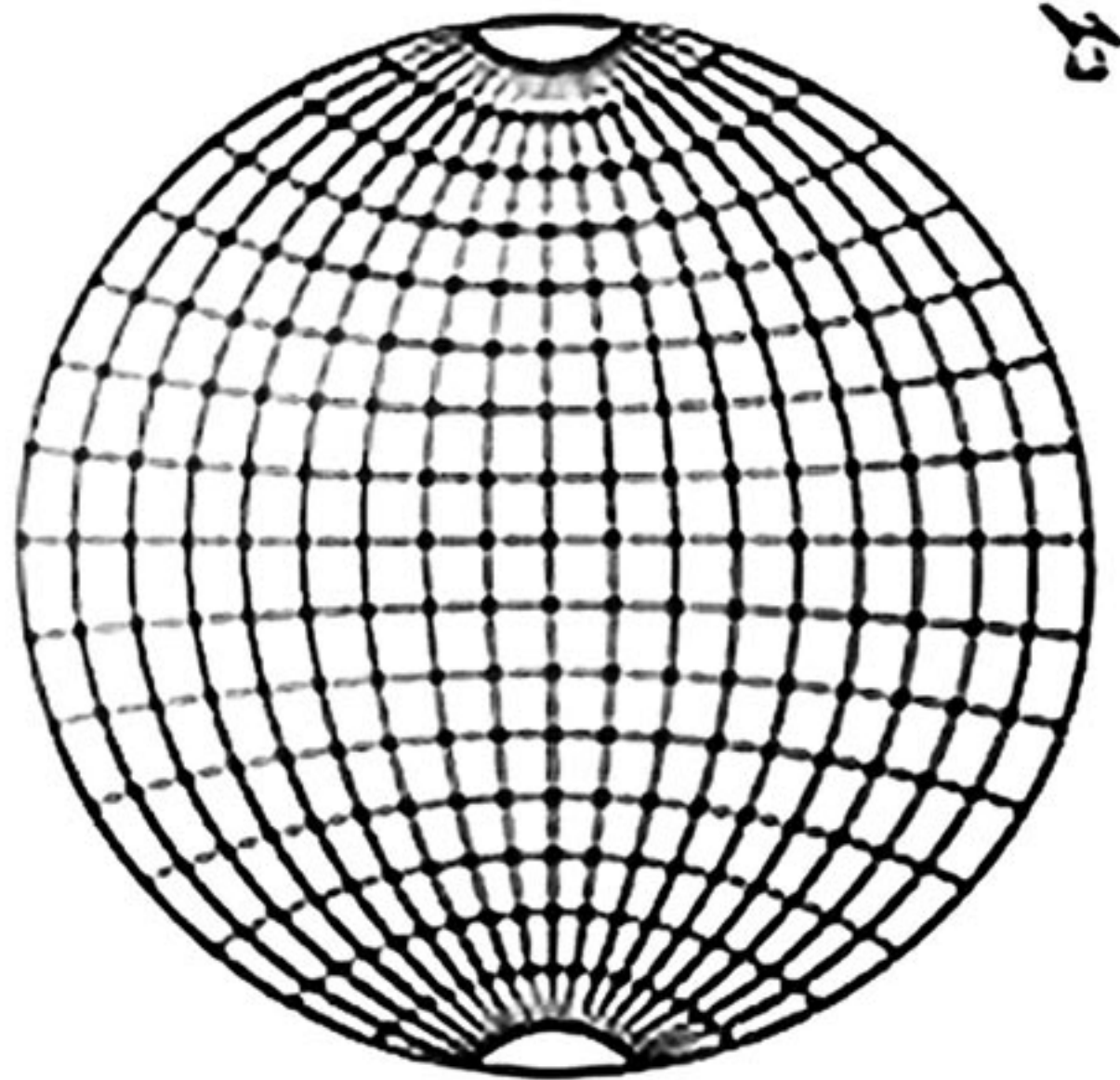


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13

GEMINI 9 — OGO — SURVEYOR MOON SHOTS

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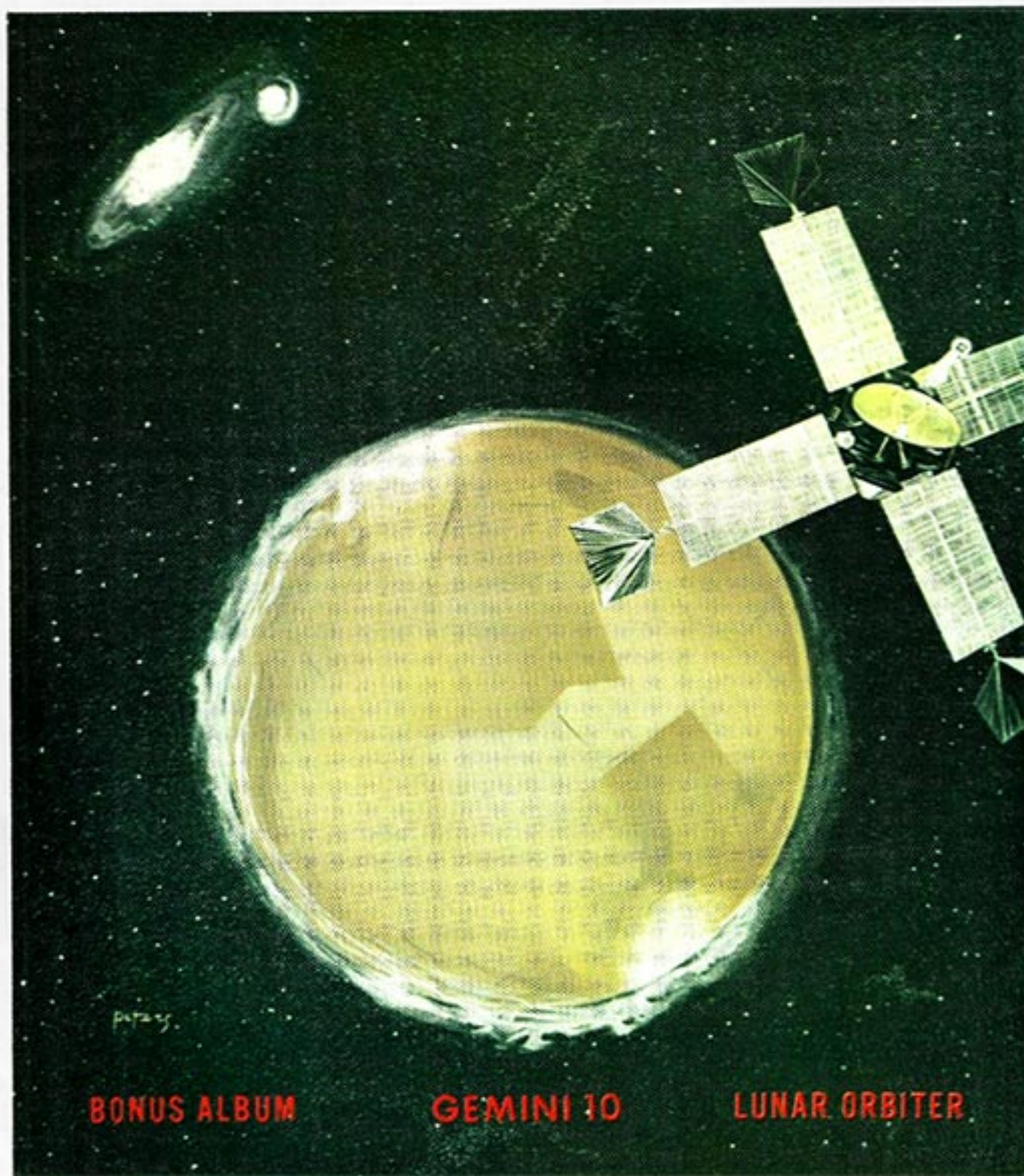


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BONUS ALBUM

GEMINI 10

LUNAR ORBITER

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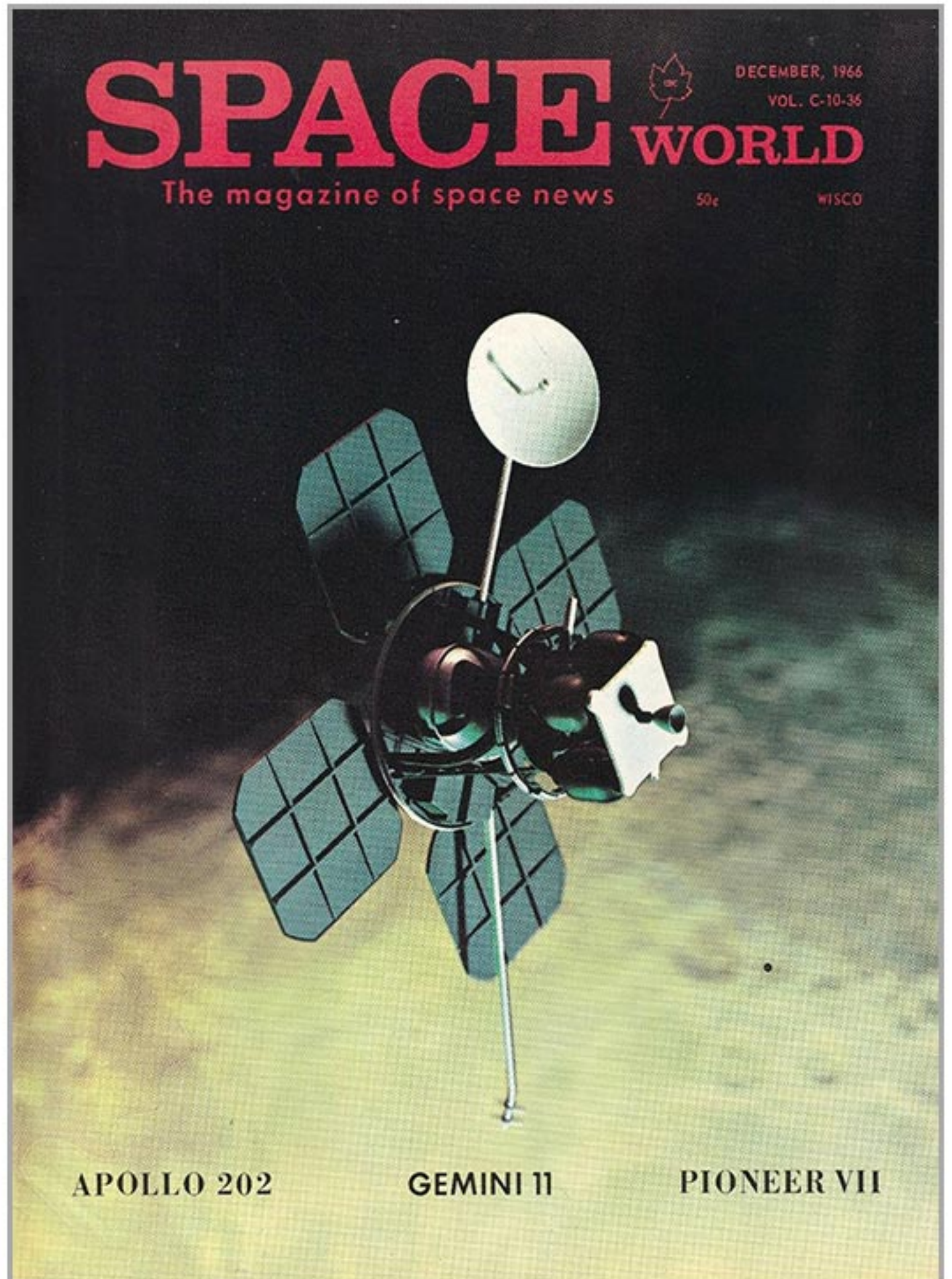


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APOLLO 202

GEMINI 11

PIONEER VII



**SPACE** WORLD

1967



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COMSAT

ATLAS - CENTAUR 9

GEMINI 12

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TITAN III-C

ASTRONAUT PHOTOS

COMPLETE SPACE LOG

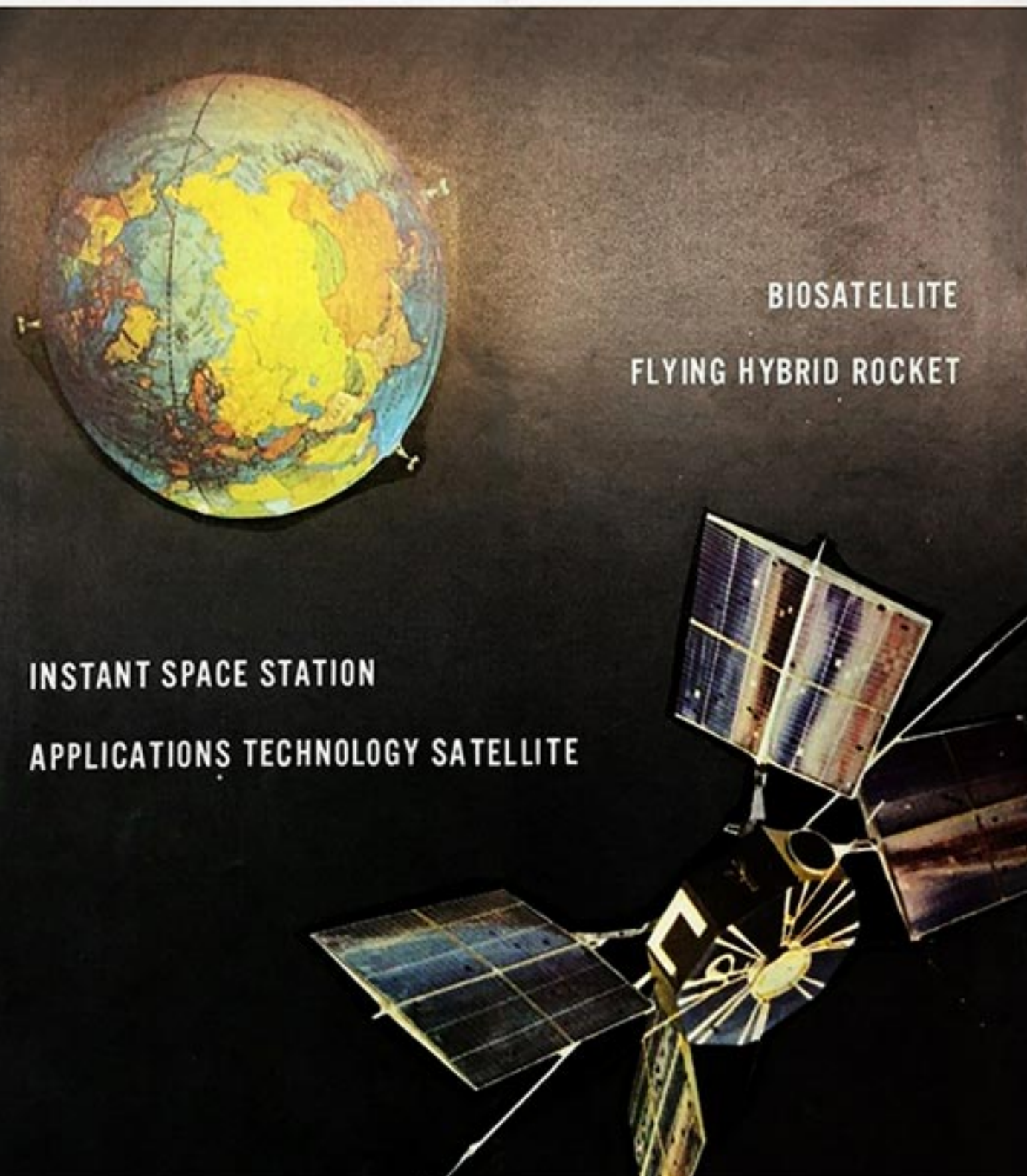
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BIOSATELLITE

FLYING HYBRID ROCKET

INSTANT SPACE STATION

APPLICATIONS TECHNOLOGY SATELLITE

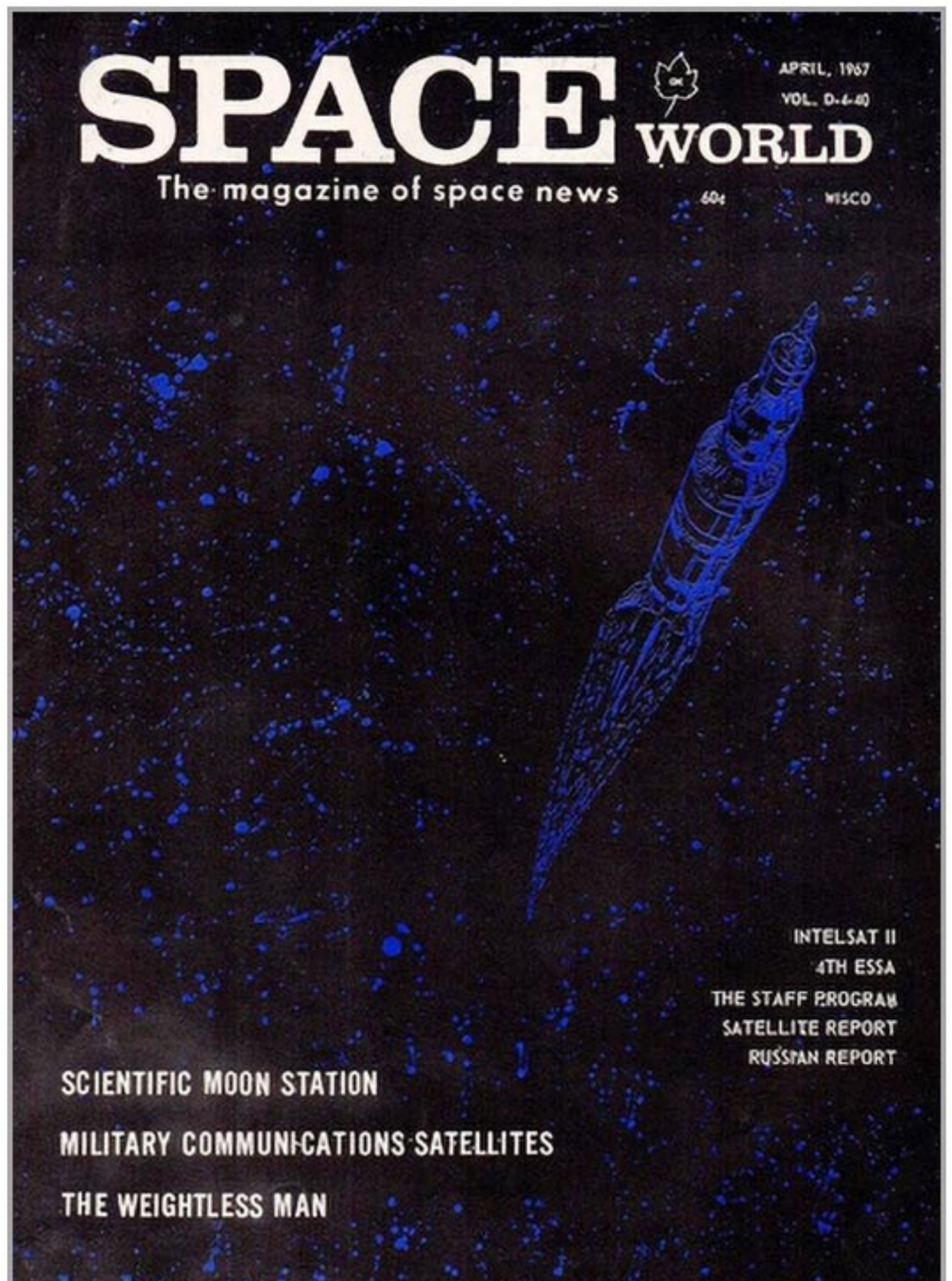
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INTELSAT II  
4TH ESSA  
THE STAFF PROGRAM  
SATELLITE REPORT  
RUSSIAN REPORT

SCIENTIFIC MOON STATION

MILITARY COMMUNICATIONS SATELLITES

THE WEIGHTLESS MAN



# SPACE WORLD

The magazine of space news



MAY, 1967  
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THIRD ORBITER MOON PHOTO  
LAUNCH

LUNAR LANDING RESEARCH  
VEHICLE

NIMBUS II—The "Miracle"  
Satellite

SPACE WATCHER

SALUTE TO LOCKHEED

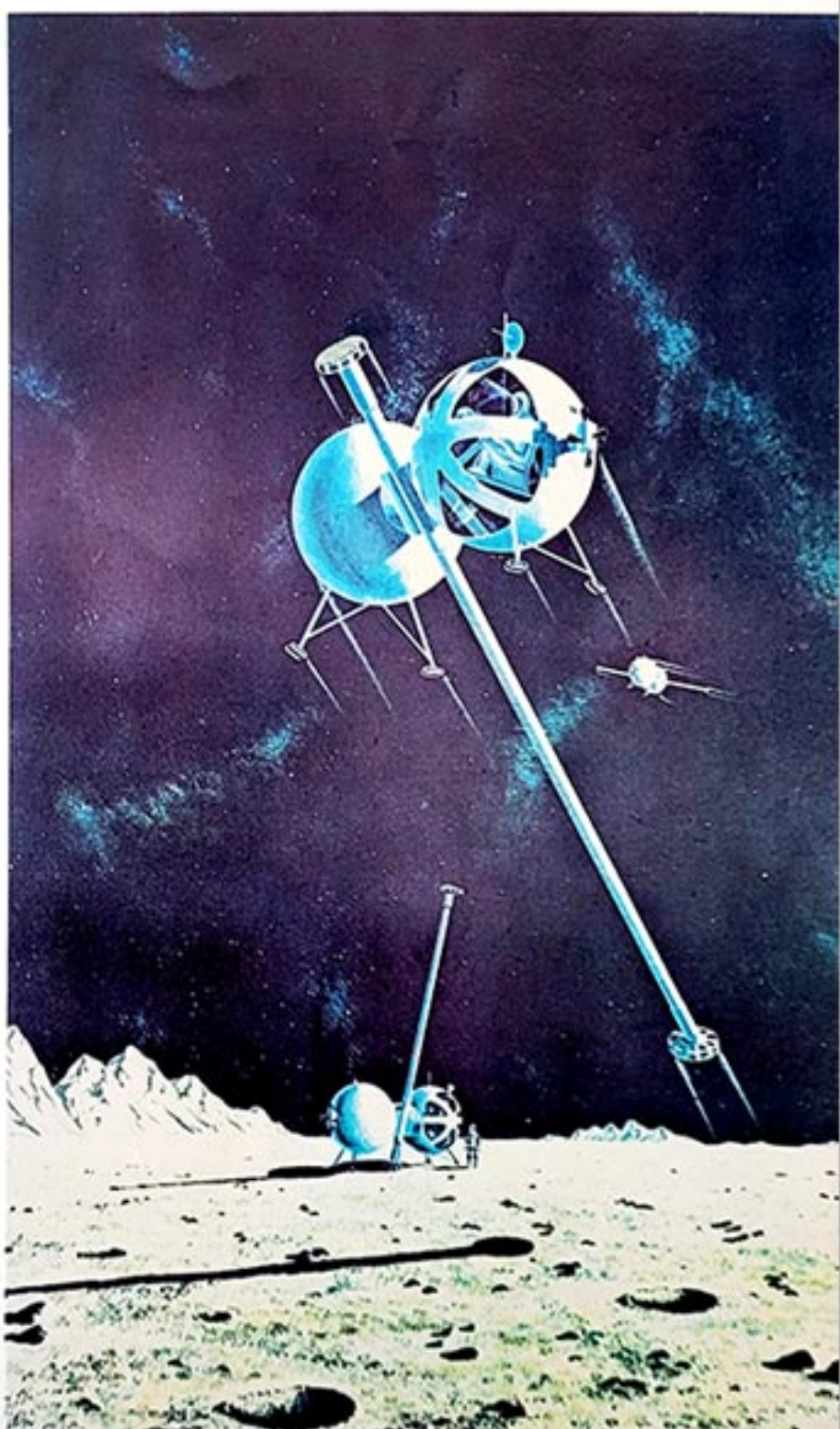
IN MEMORIAM—  
Virgil Ivan Grissom  
Edward H. White II  
Roger B. Chaffee

LUNAR LEAPER

GEMINI, SURVEYOR, LUNAR  
ORBITERS TOP 1966 SPACE  
NEWS

TESTING SATURN STAGE  
SEPARATIONS

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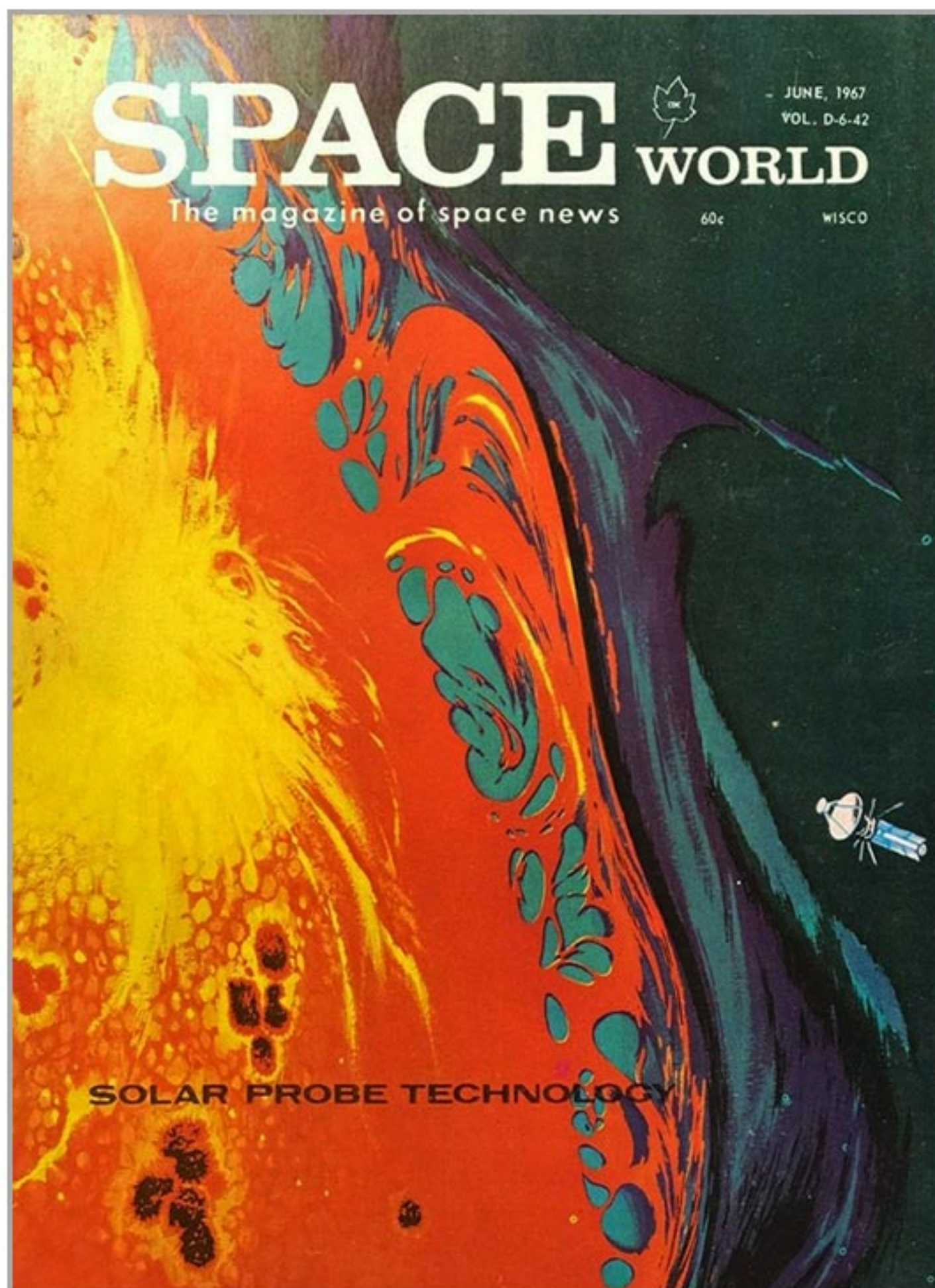
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THE FUTURE —  
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ROCKET-SONDE



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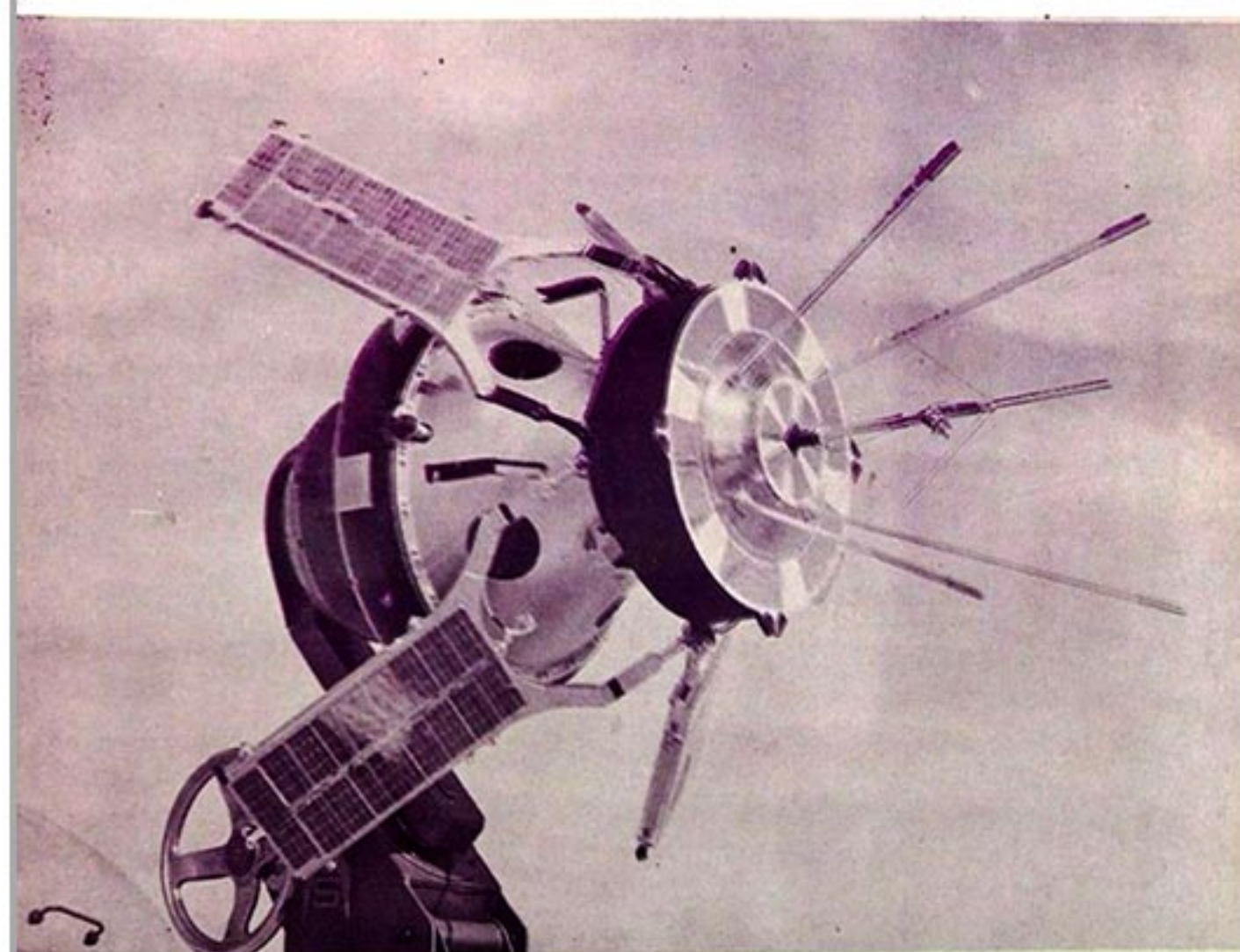
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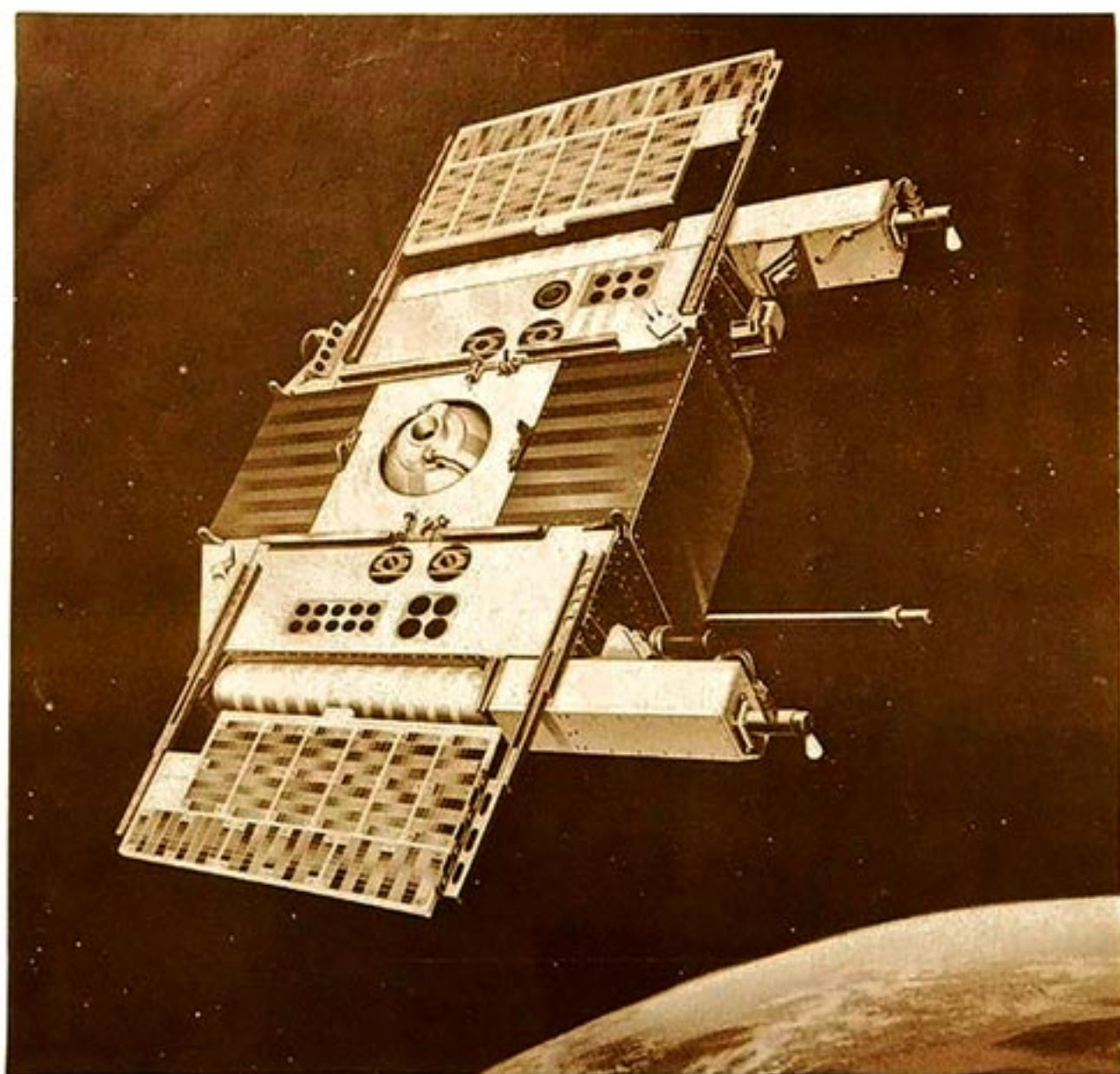
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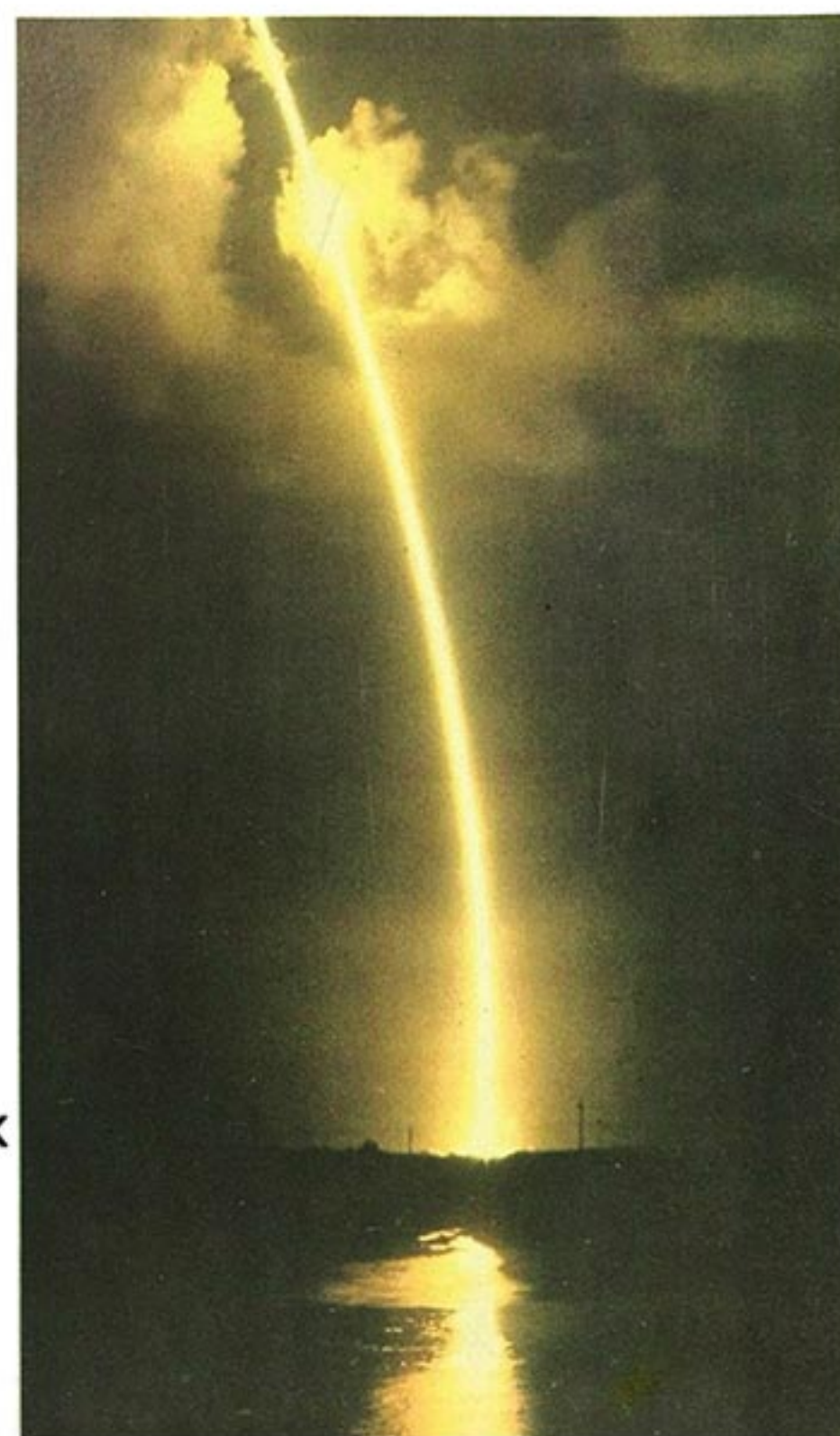
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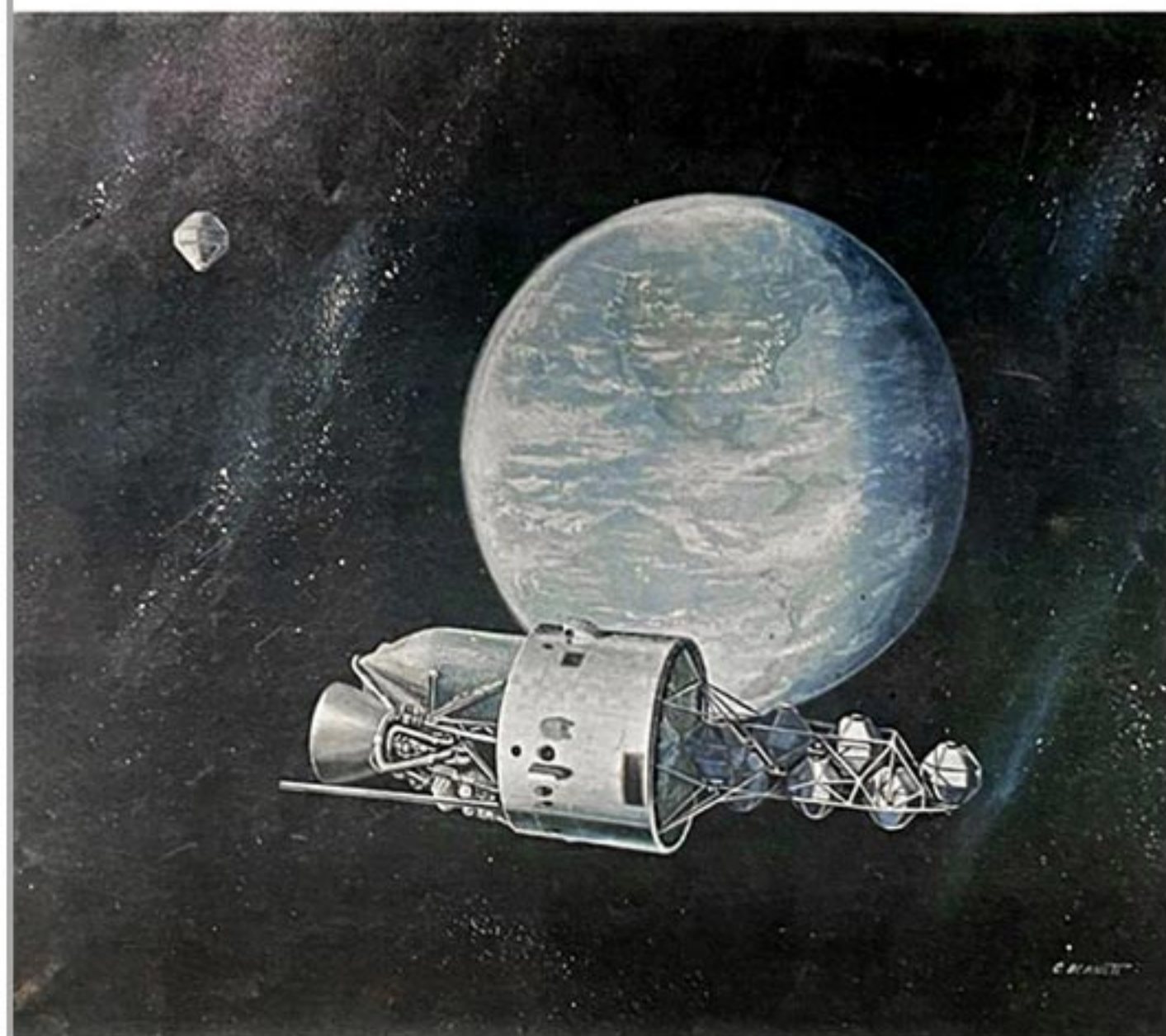
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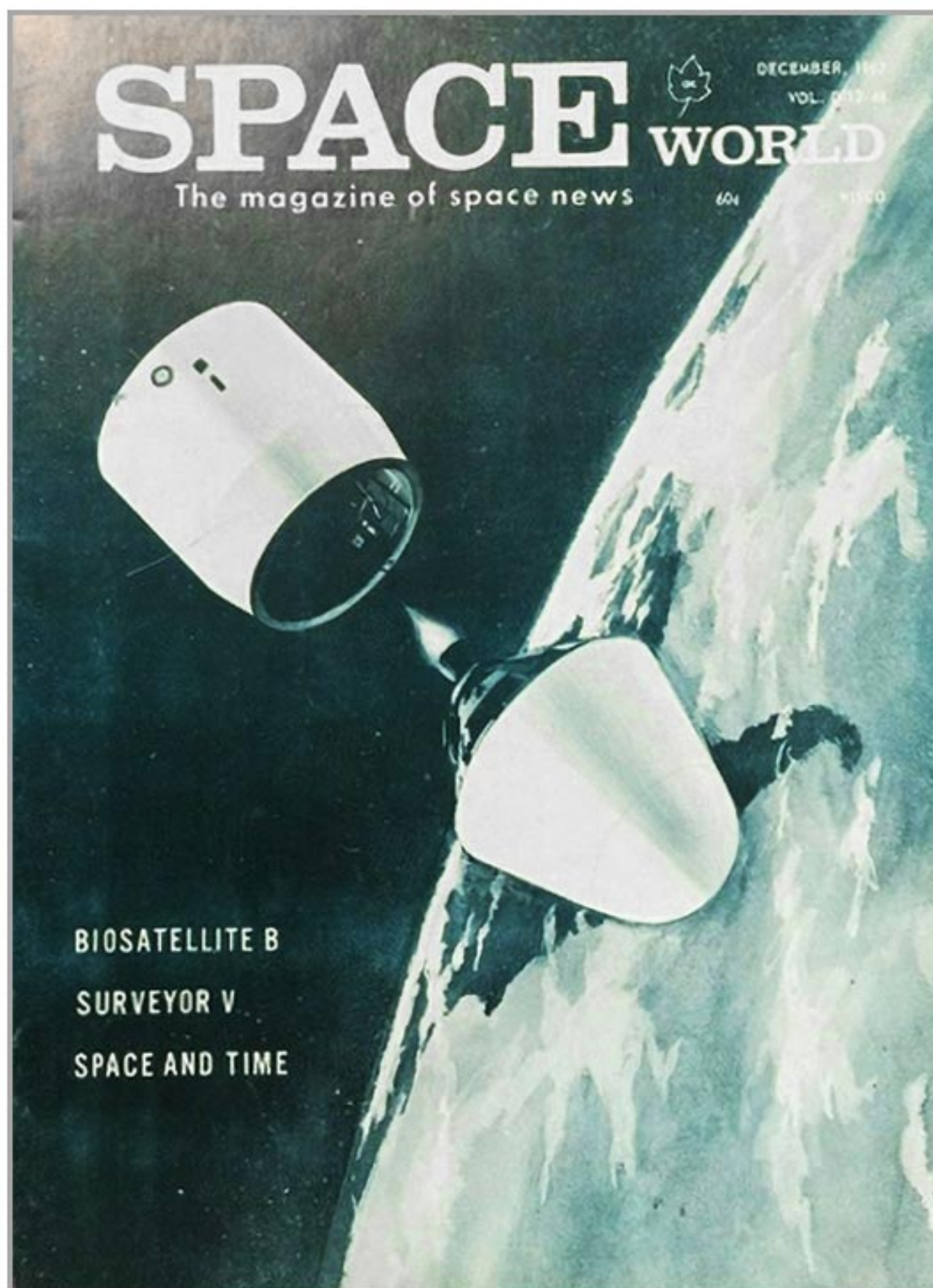


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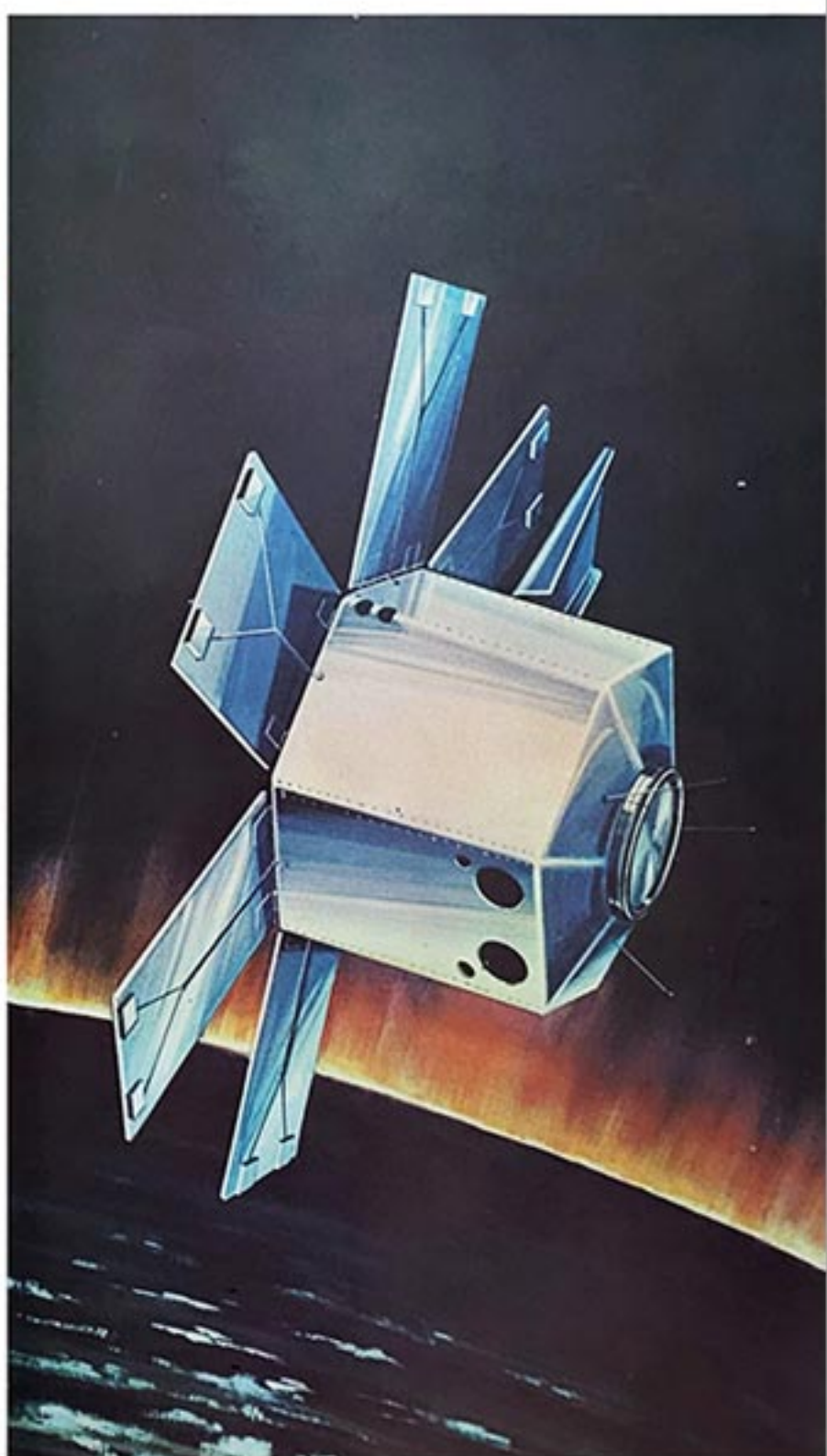
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EXPLORER XXXV  
ORBITS MOON

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RADIO-ELECTRONICS  
AND SPACE



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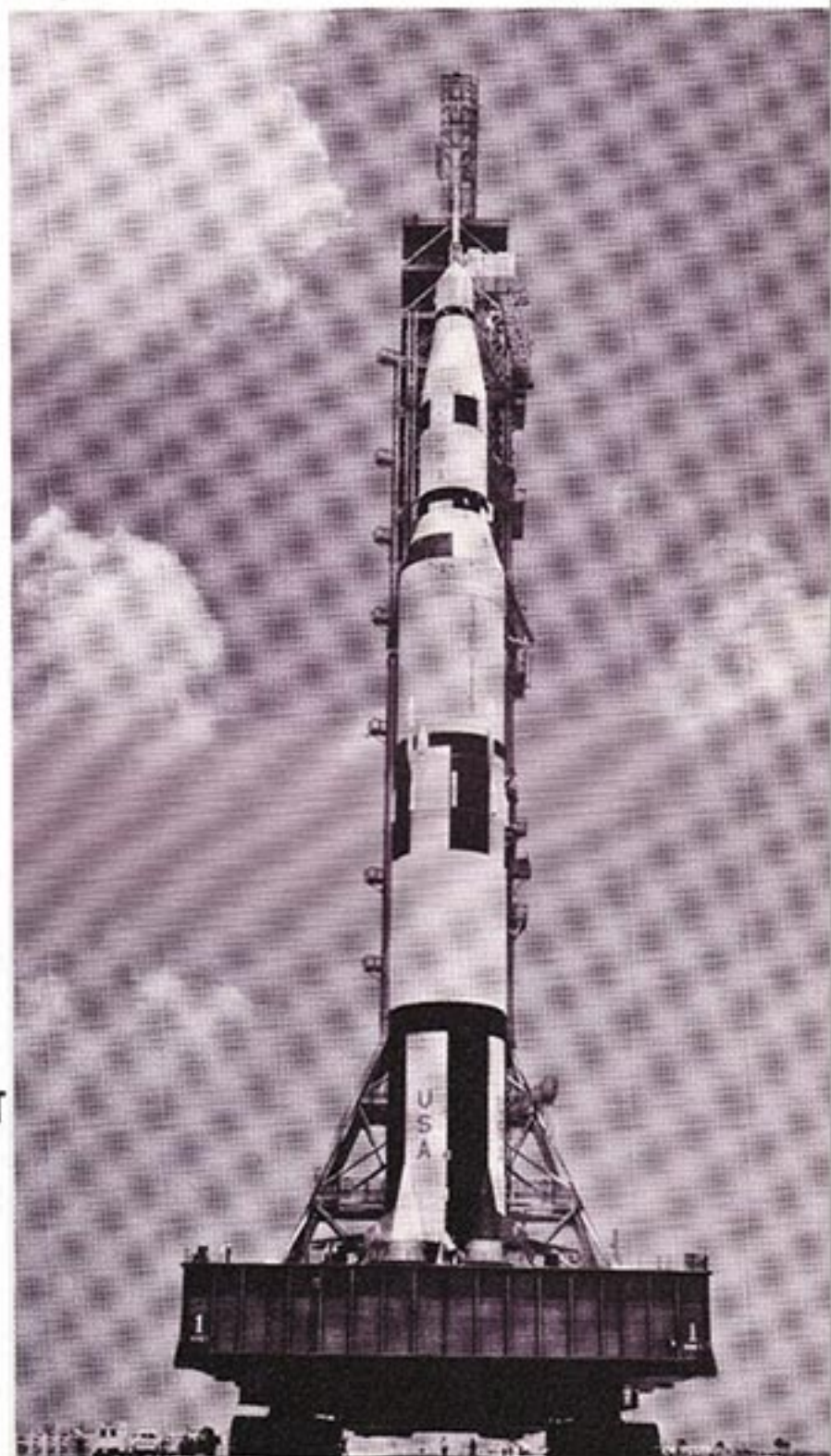
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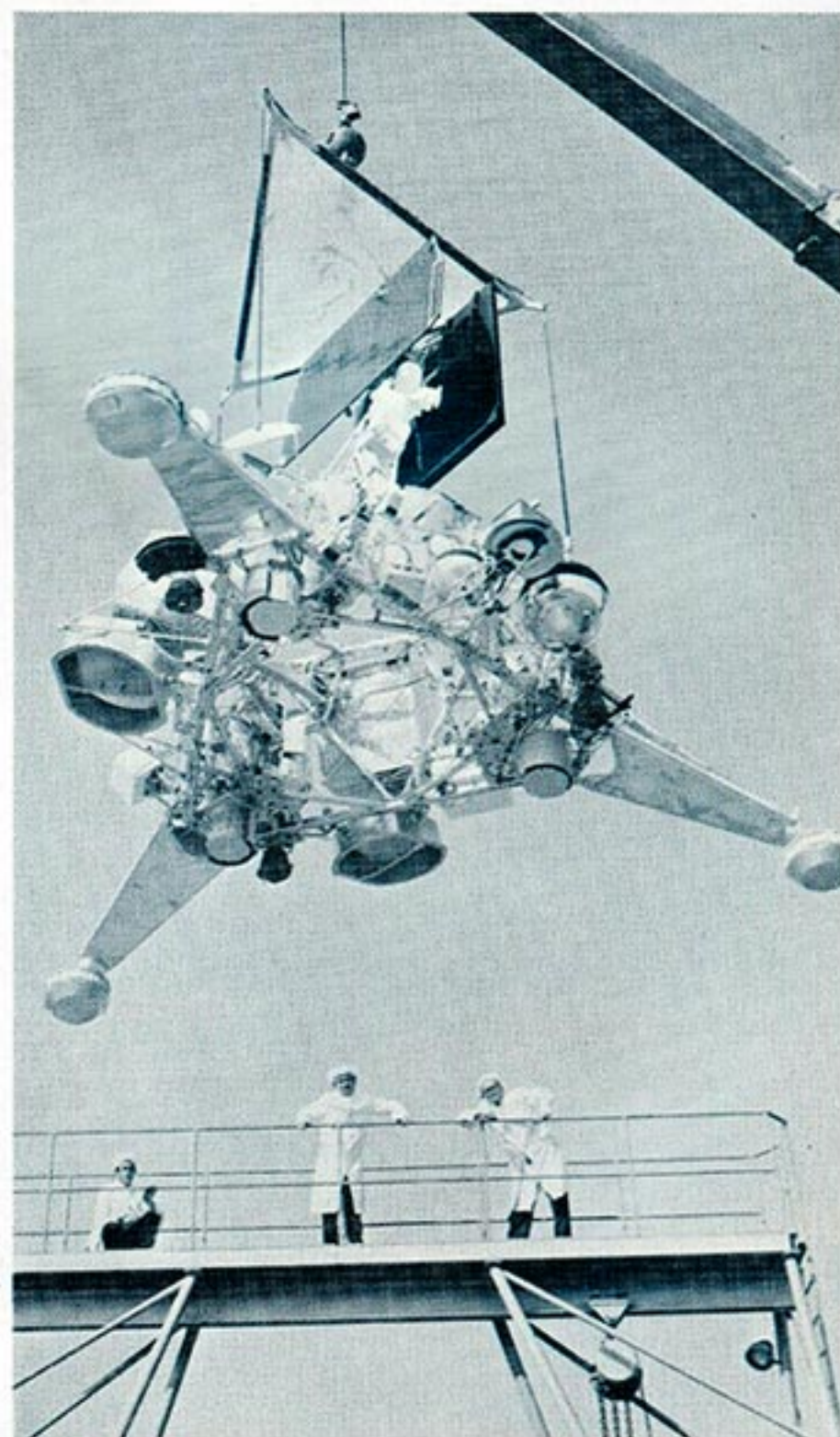
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NASA ORBITAL  
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THE MOON FROM  
ALL SIDES





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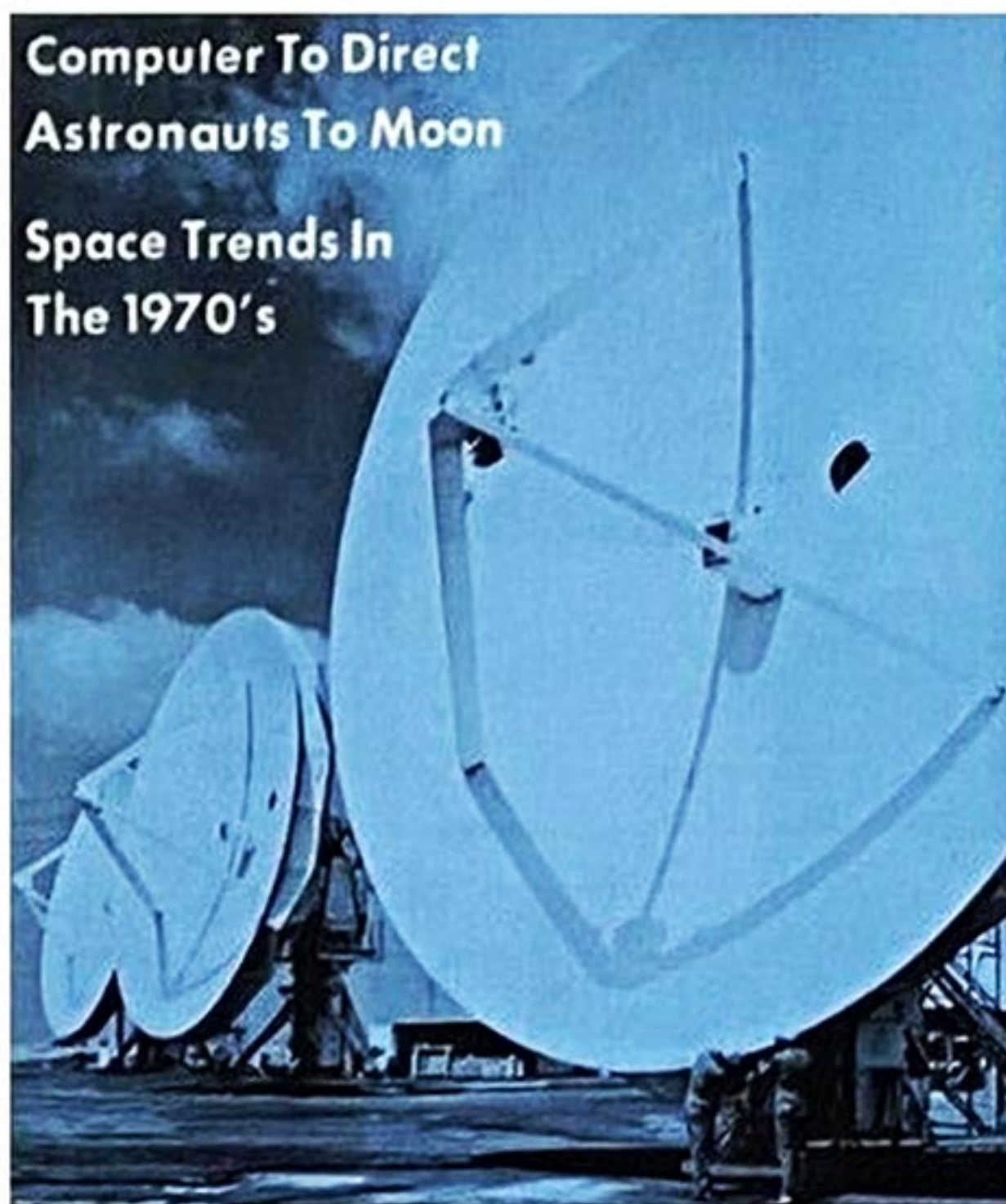
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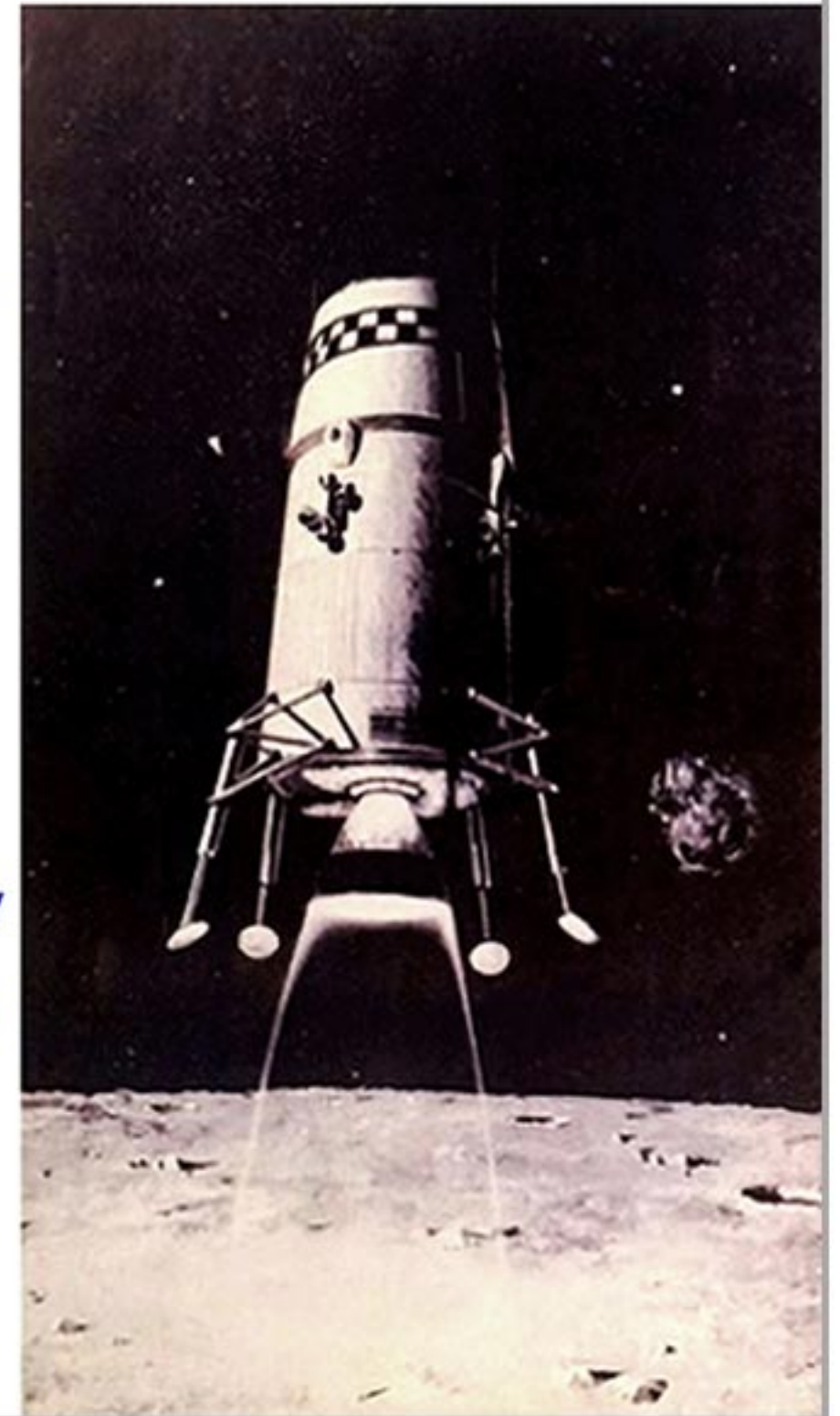
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PROPULSION ROCKET  
ENGINE

THE "MOONCOPTER"  
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AEROSPACE INDUSTRY

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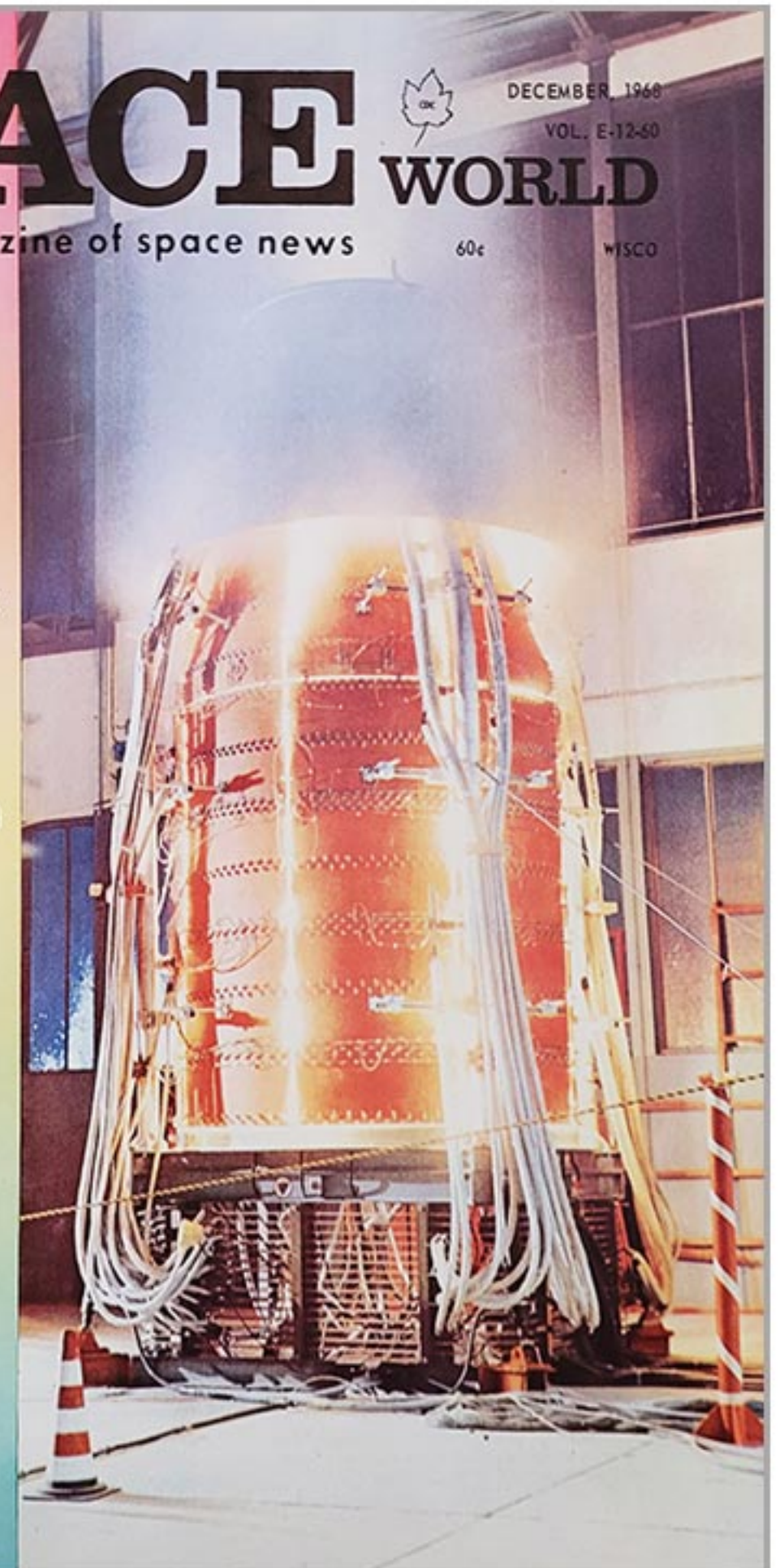
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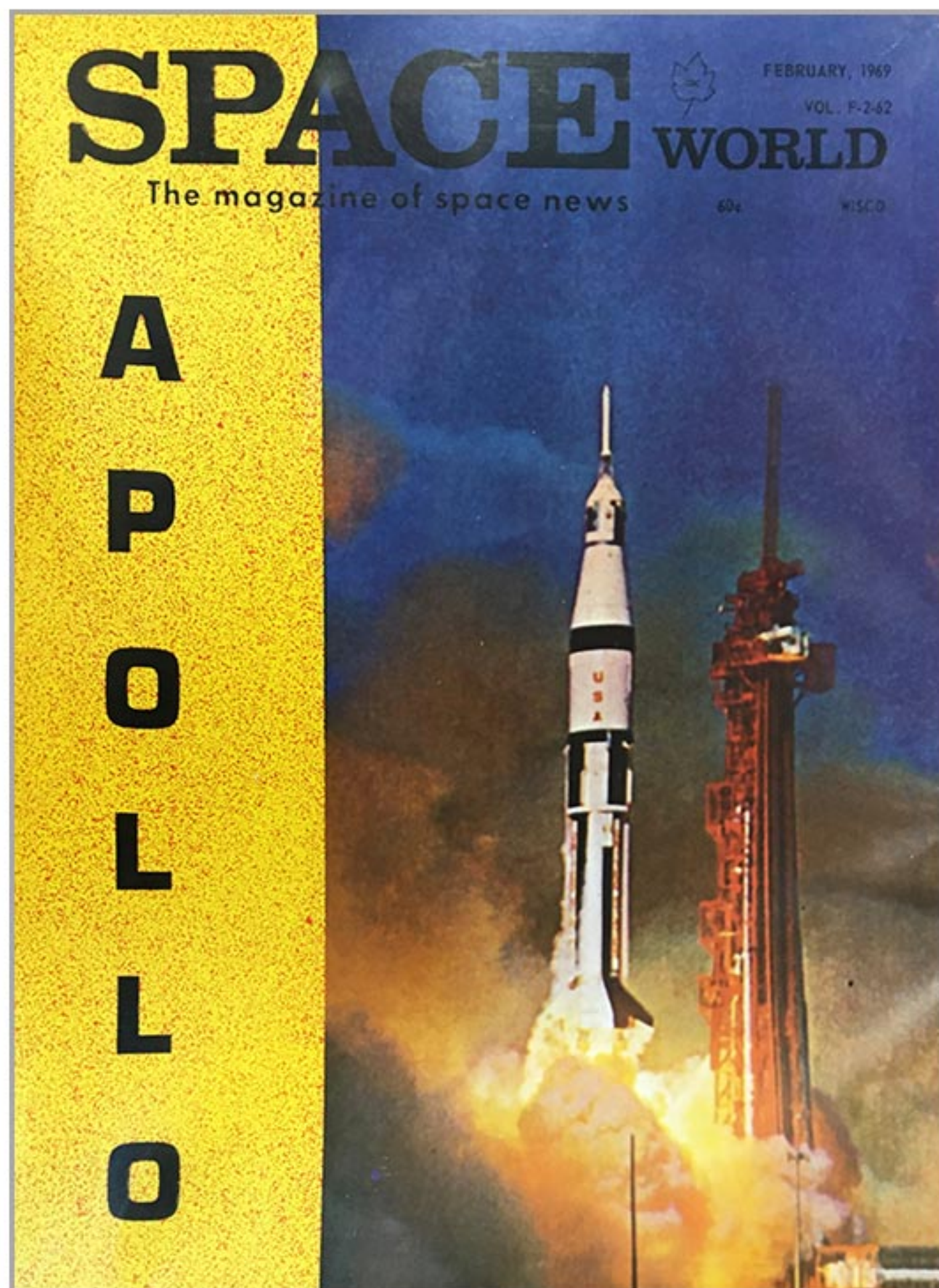




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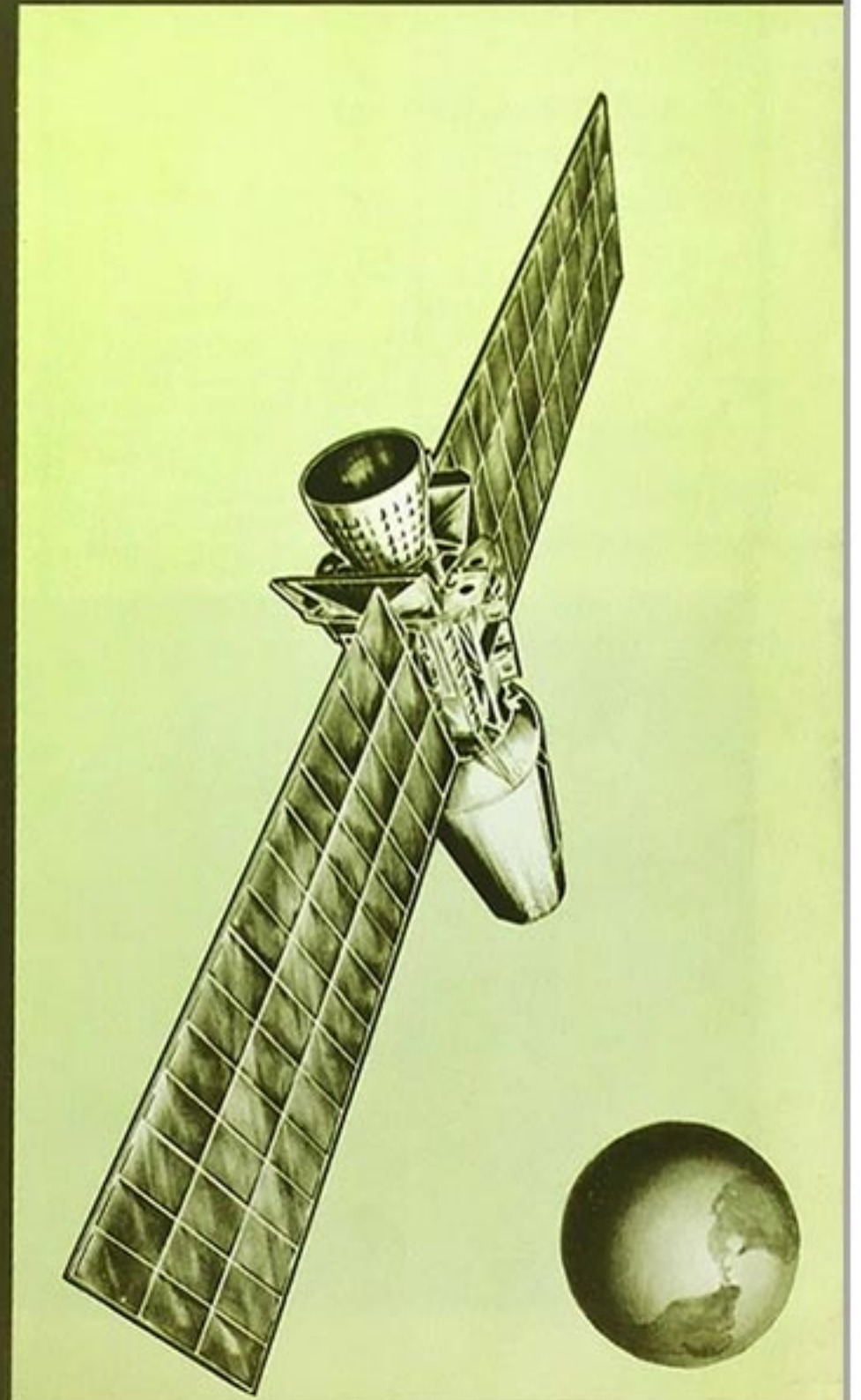
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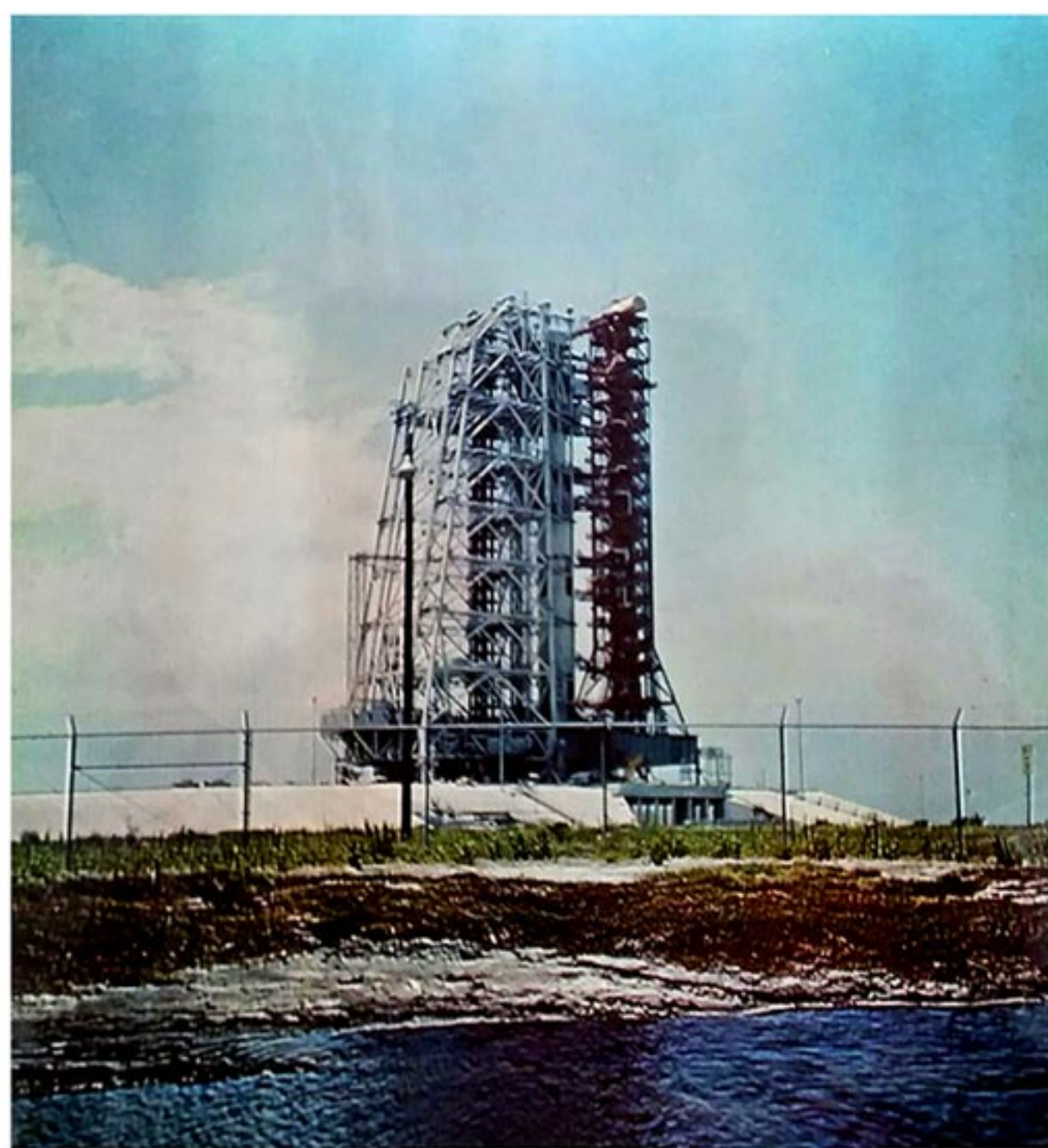


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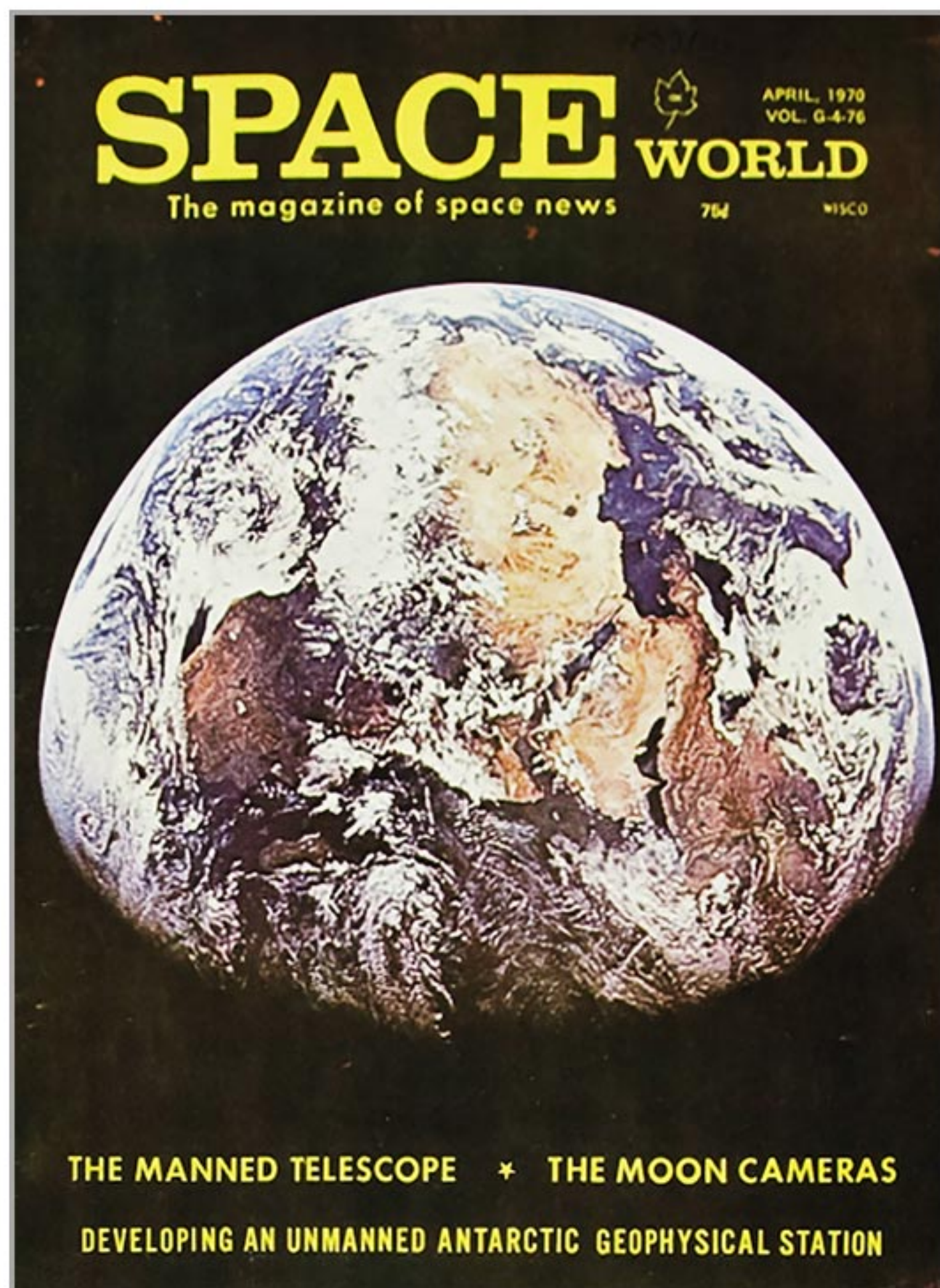
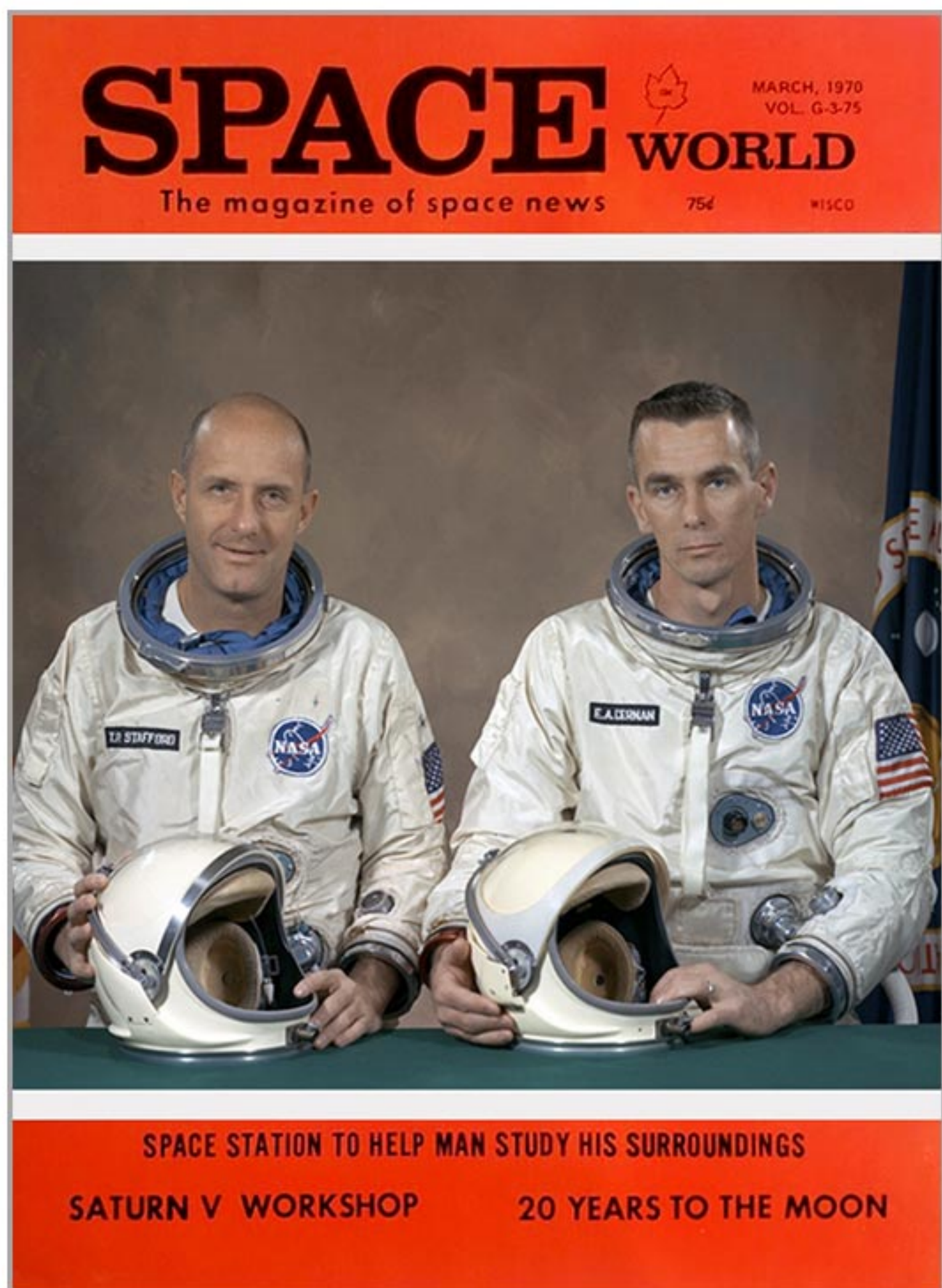
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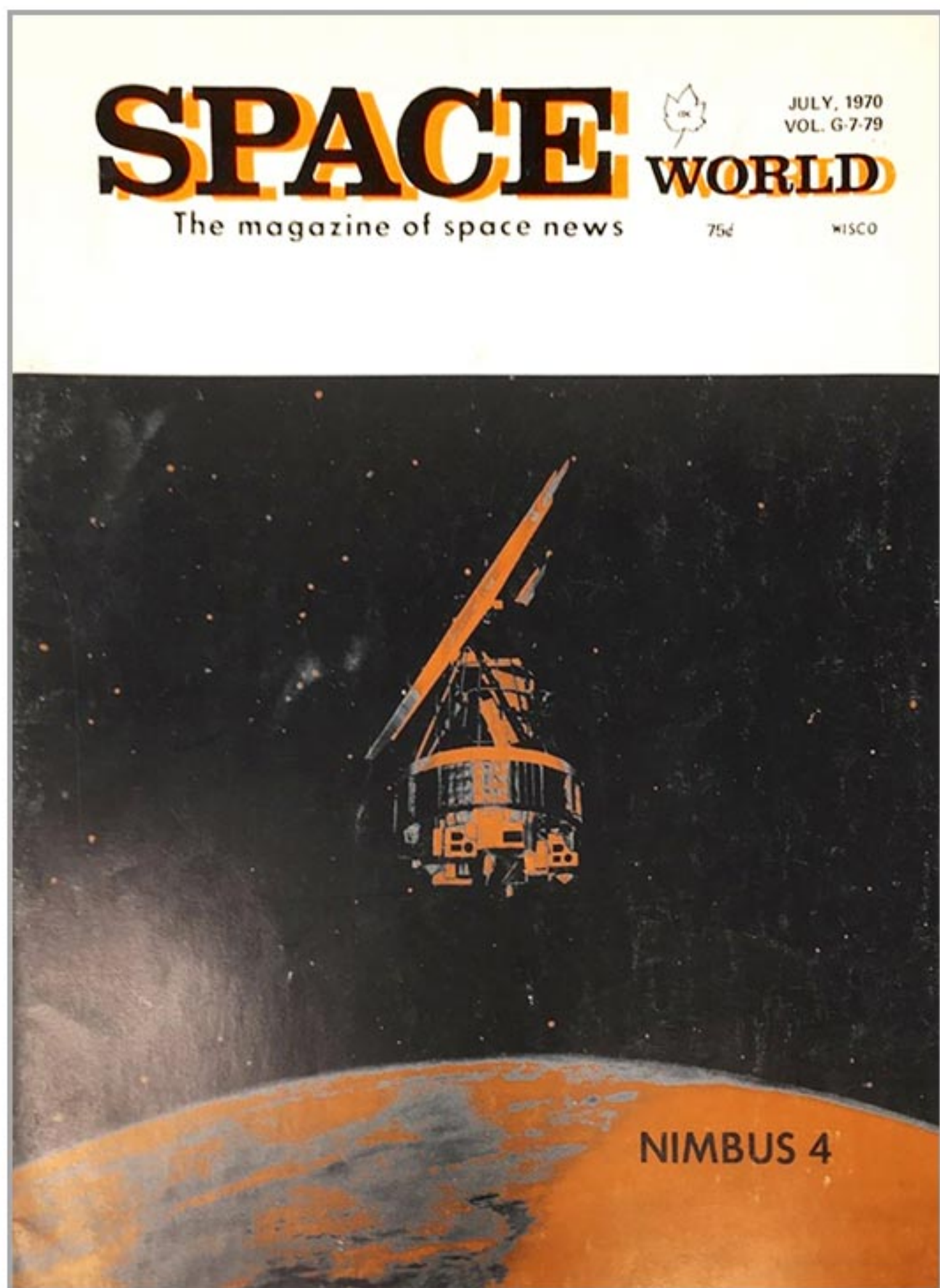
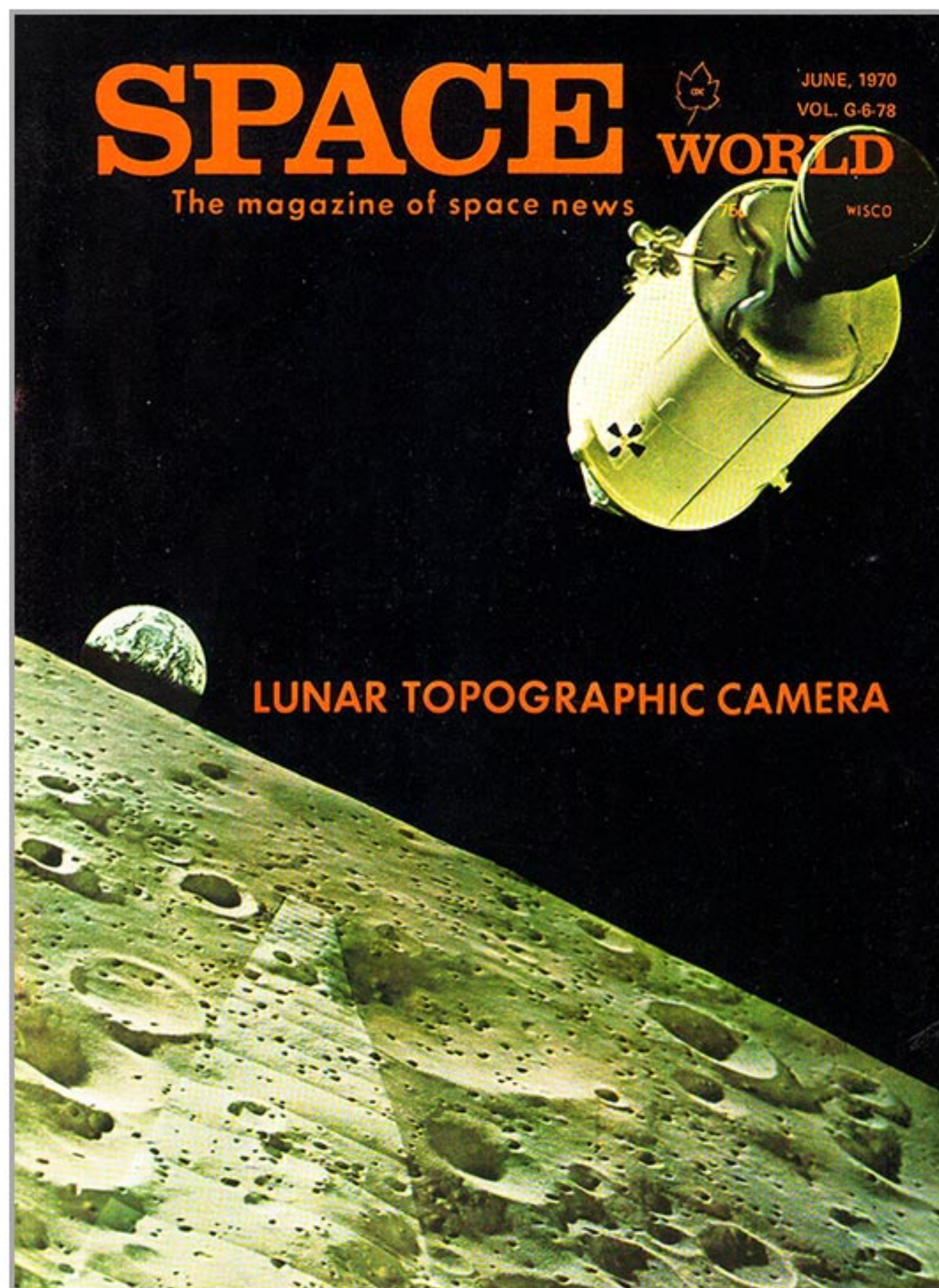
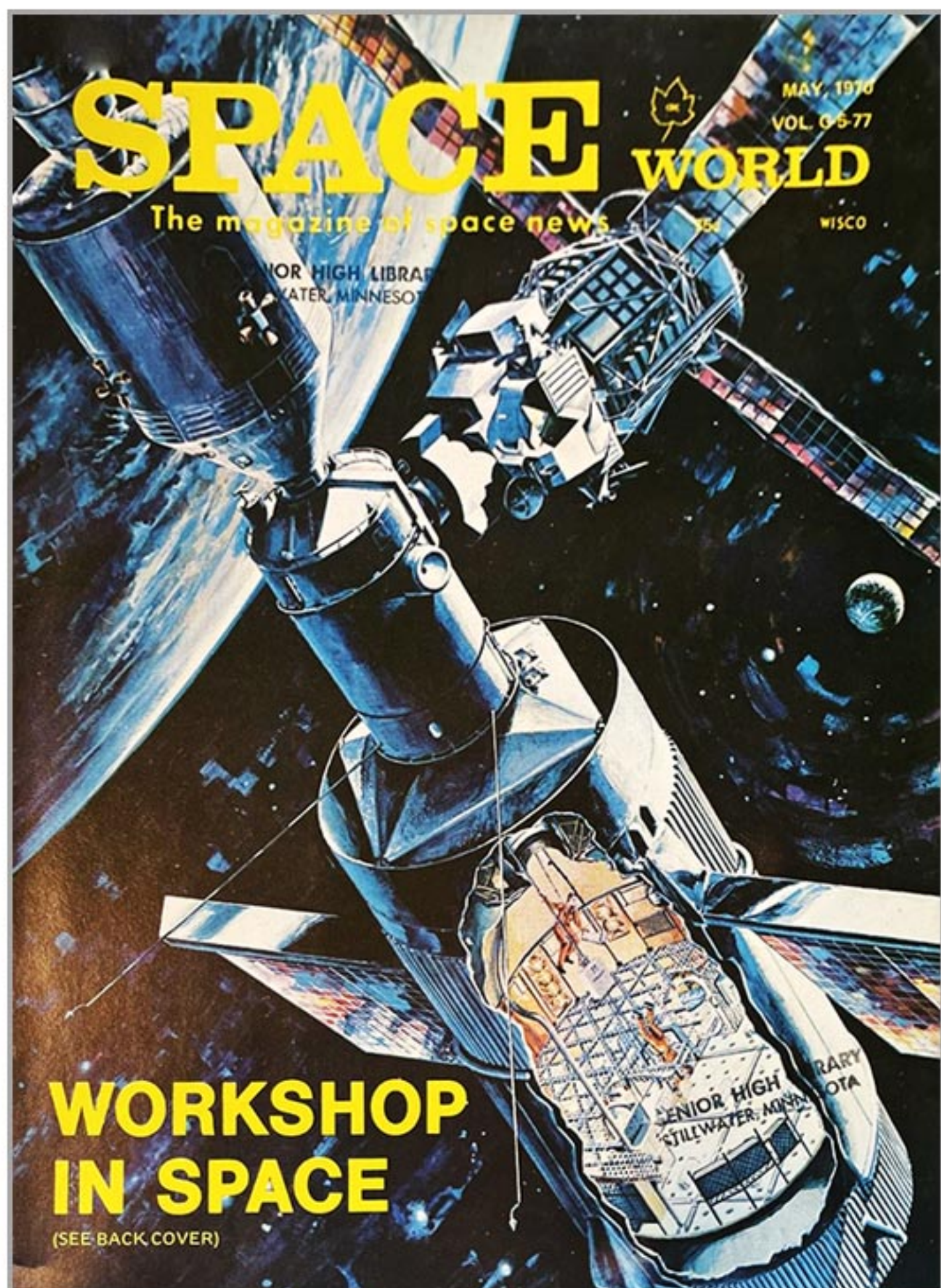
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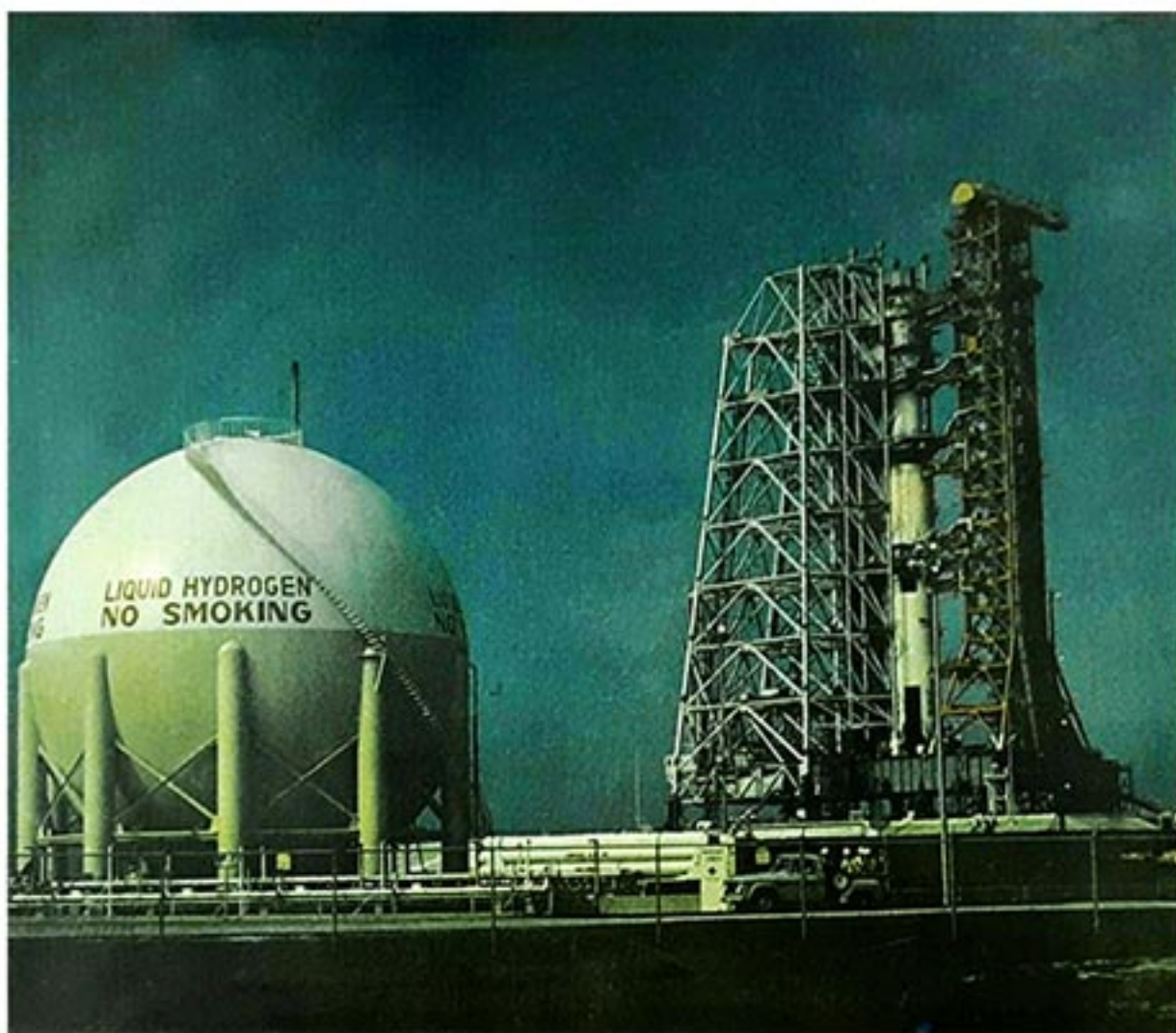
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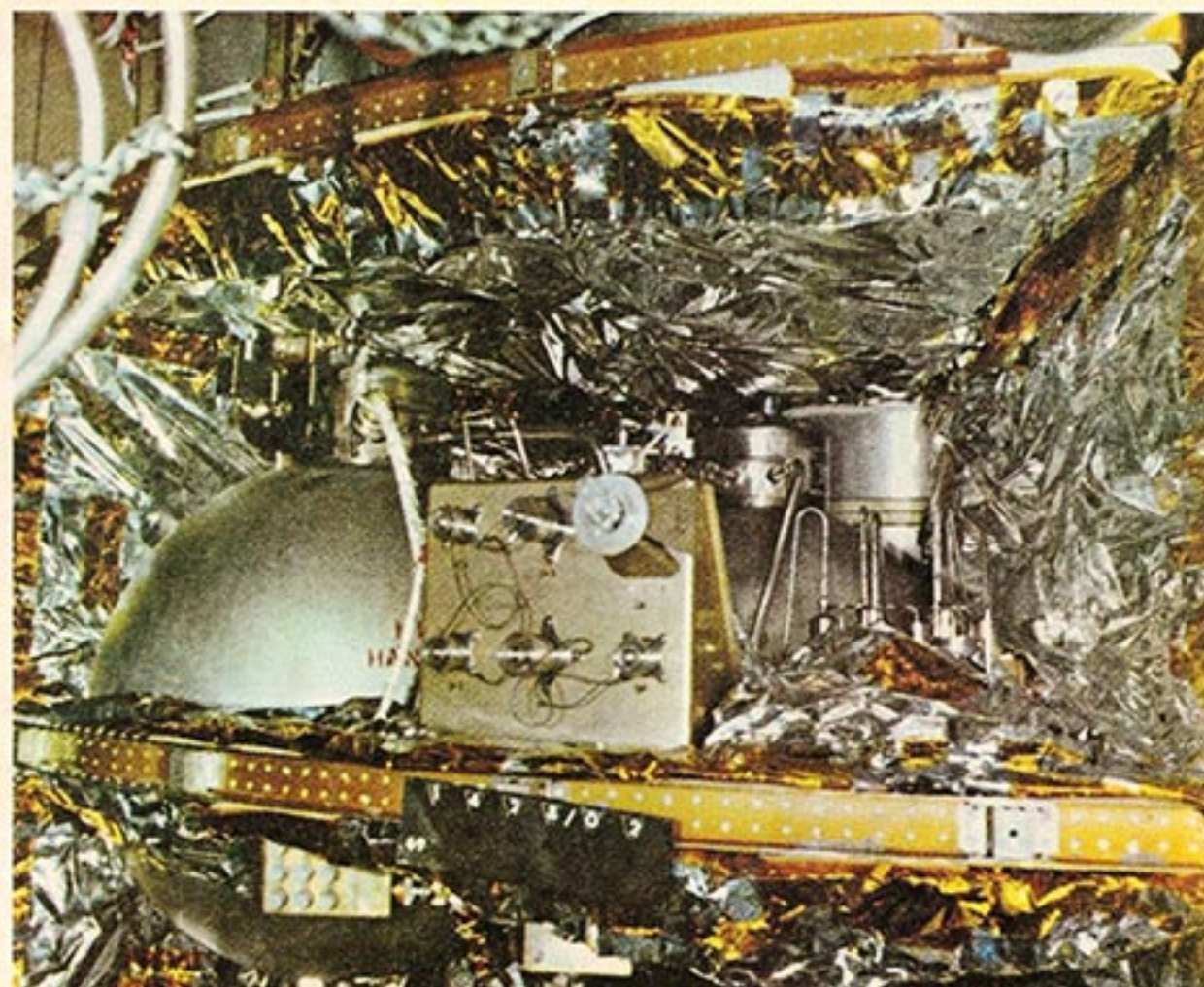
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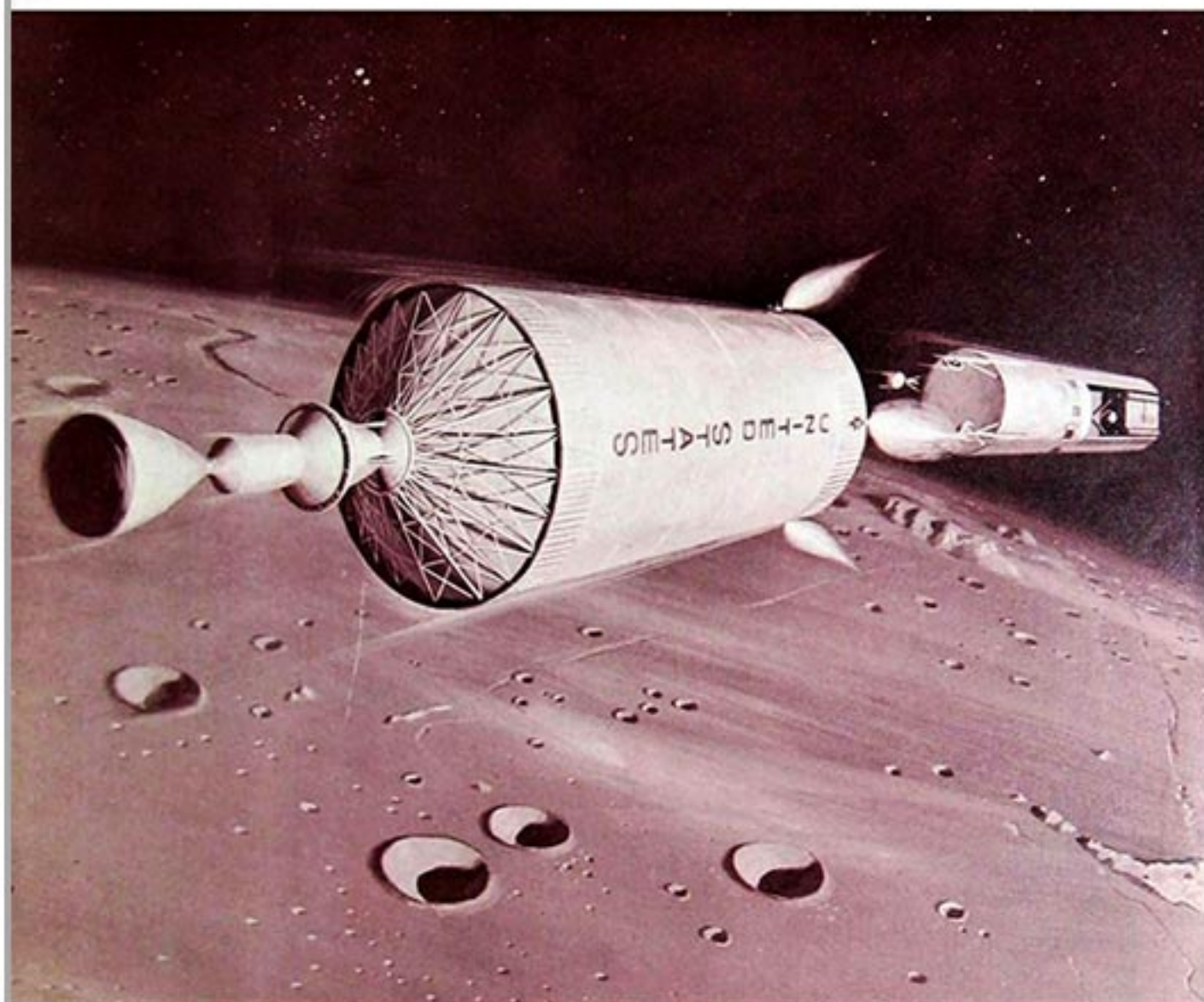
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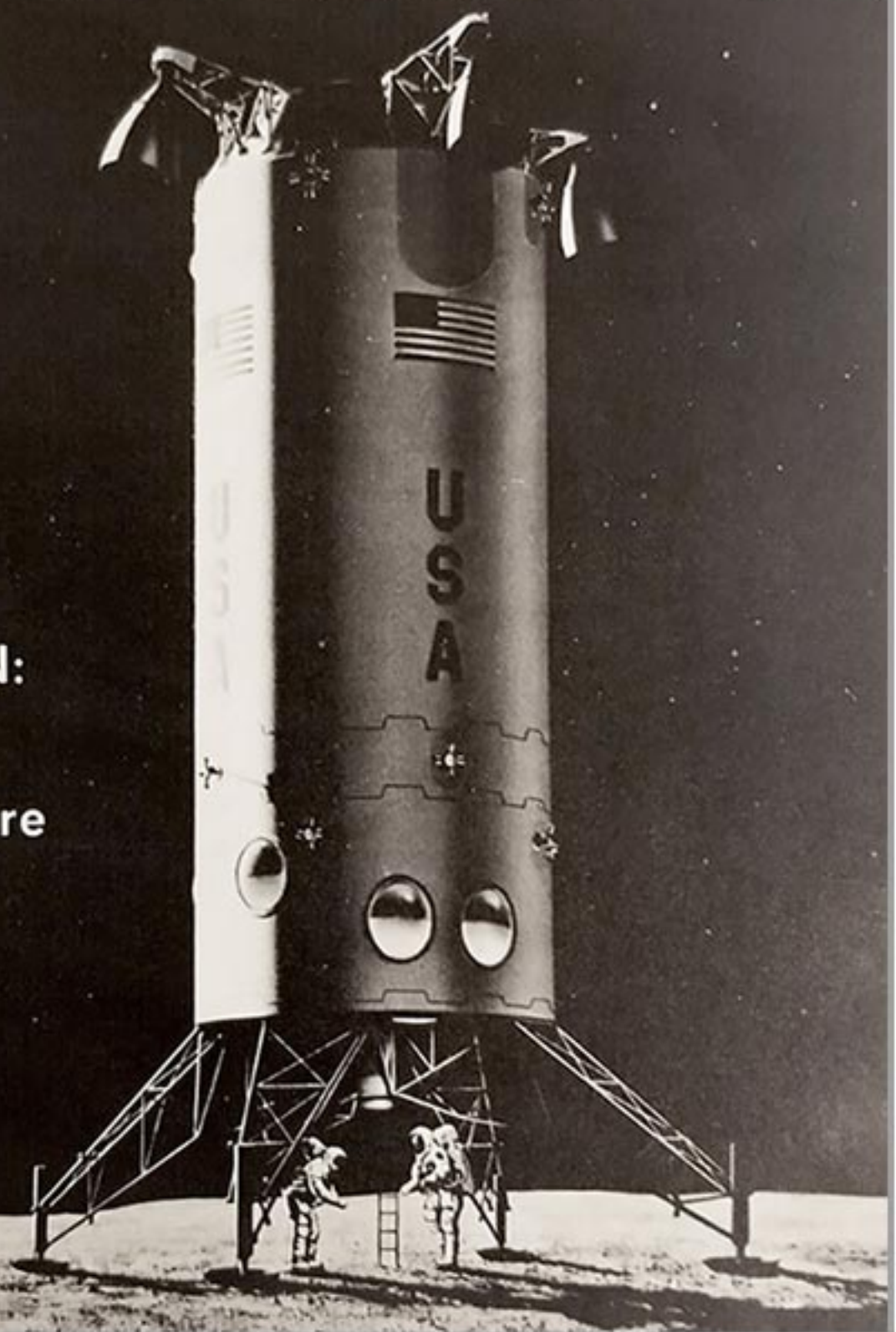
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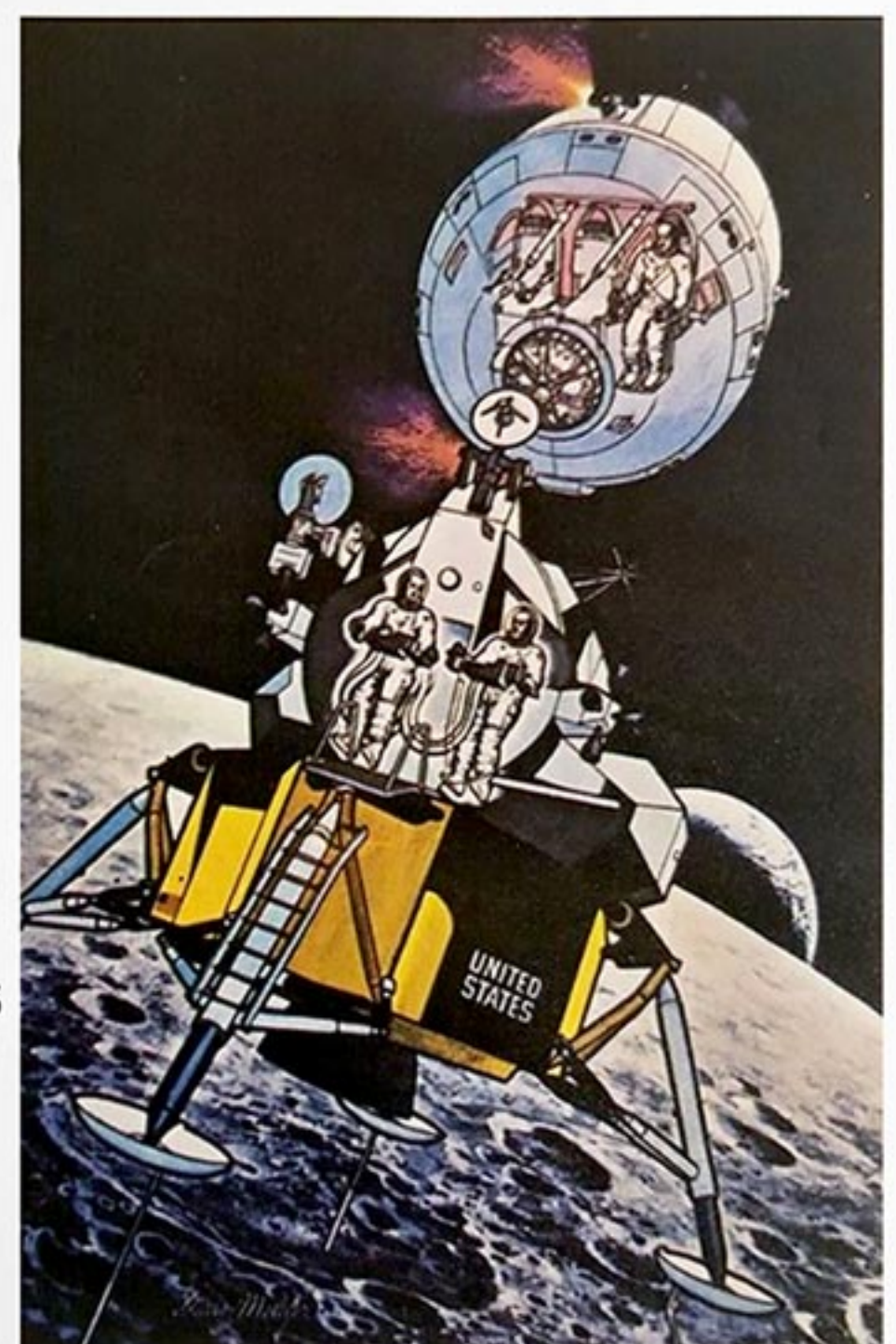
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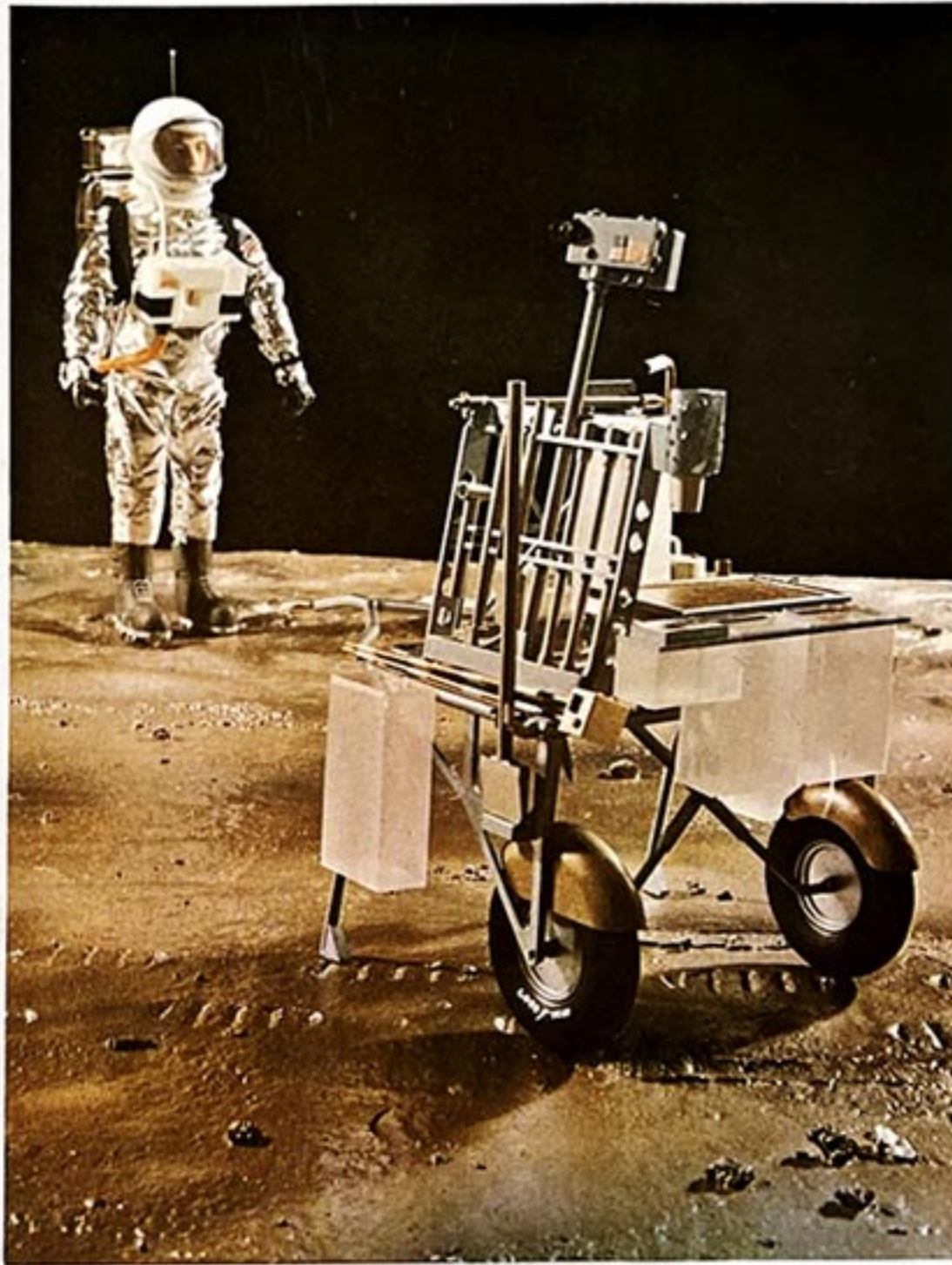
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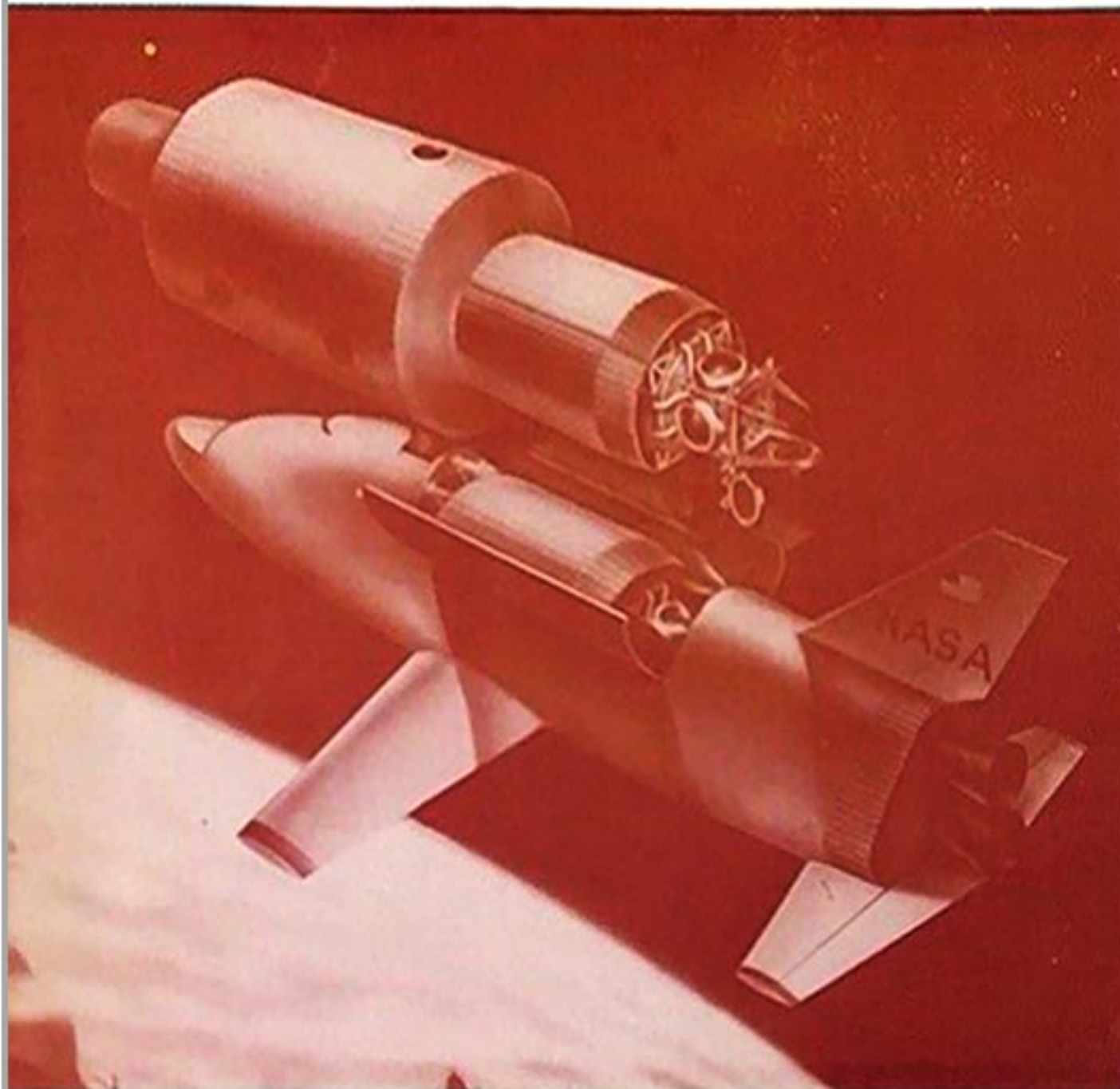
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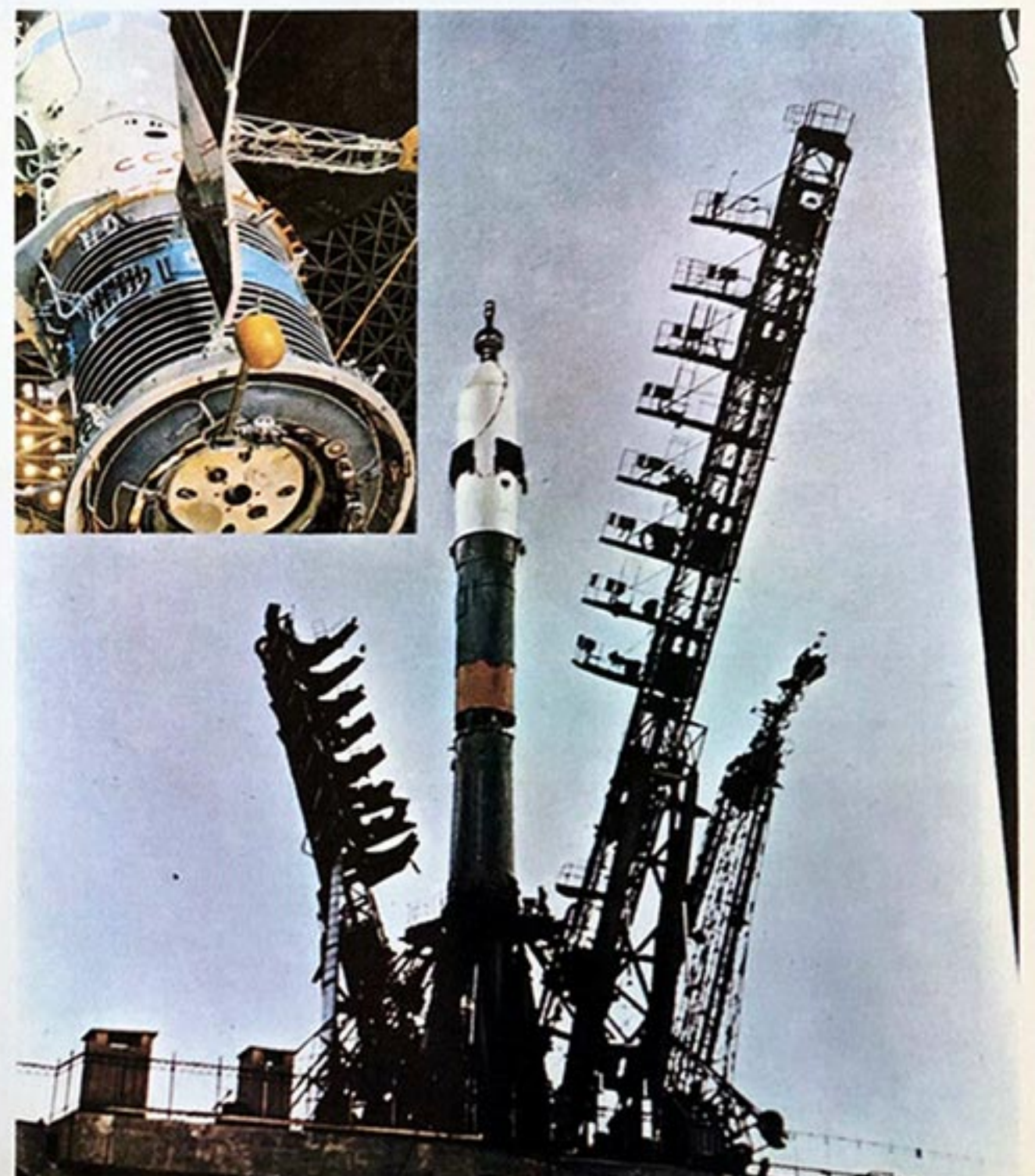
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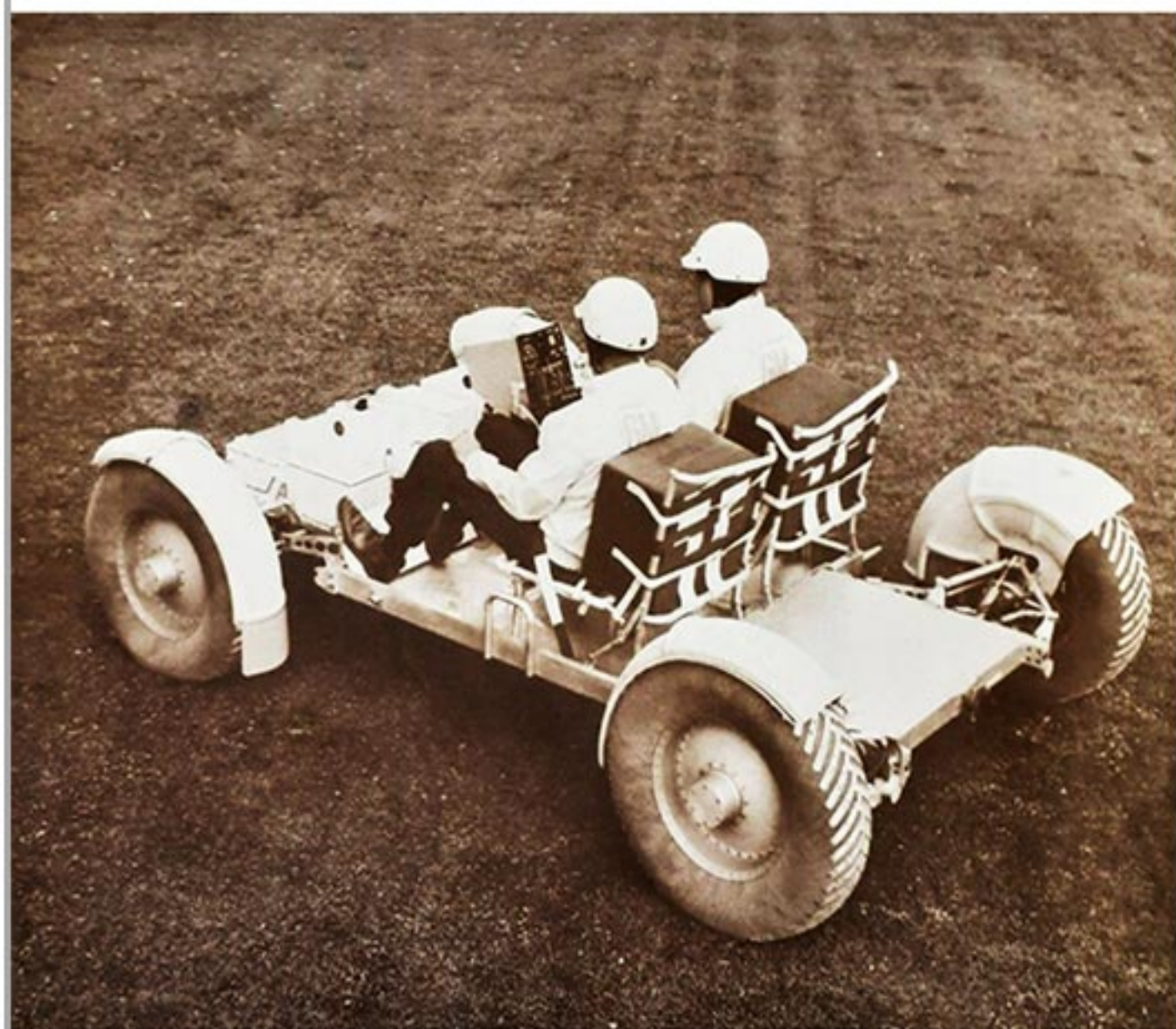
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15



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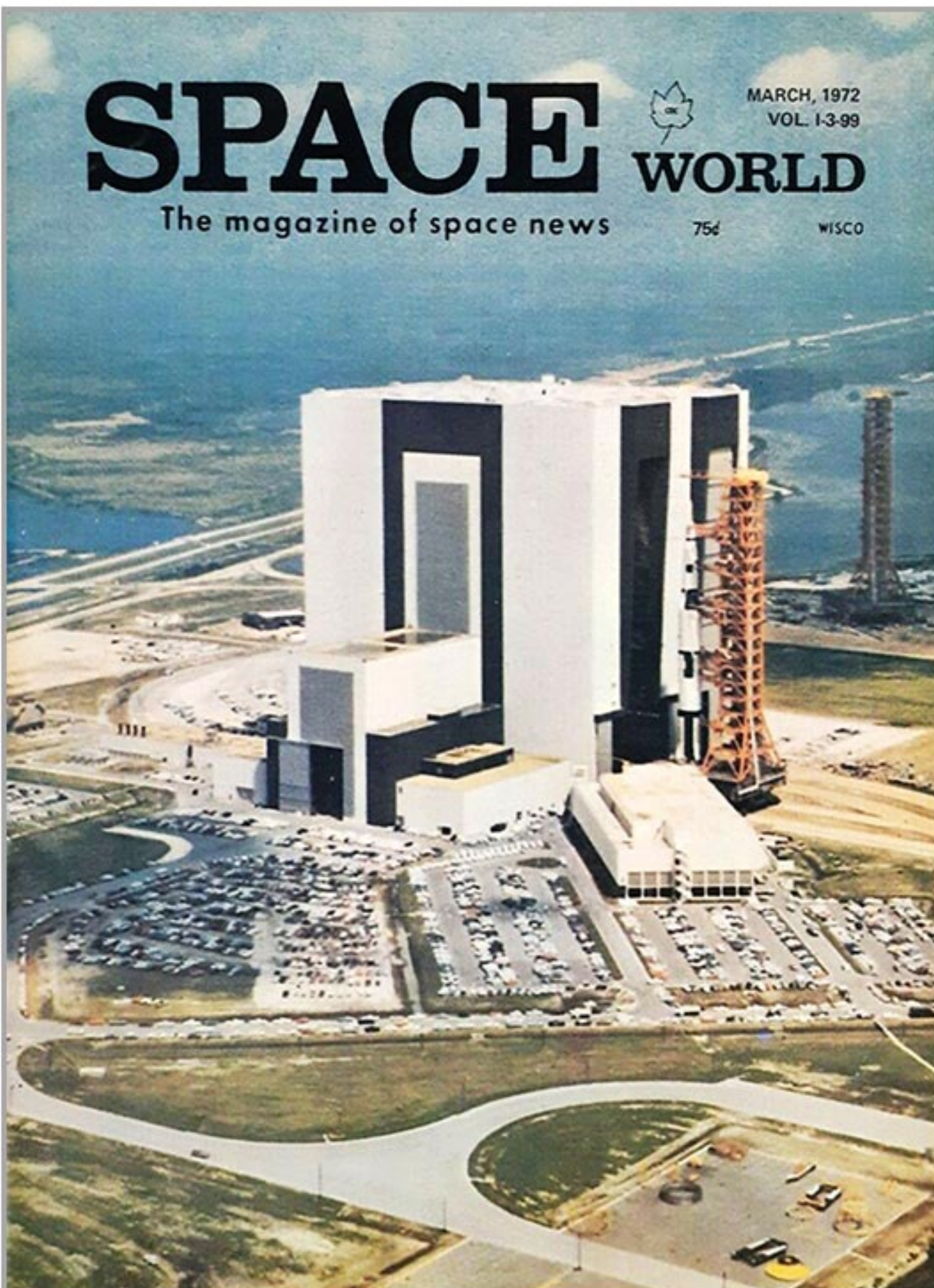
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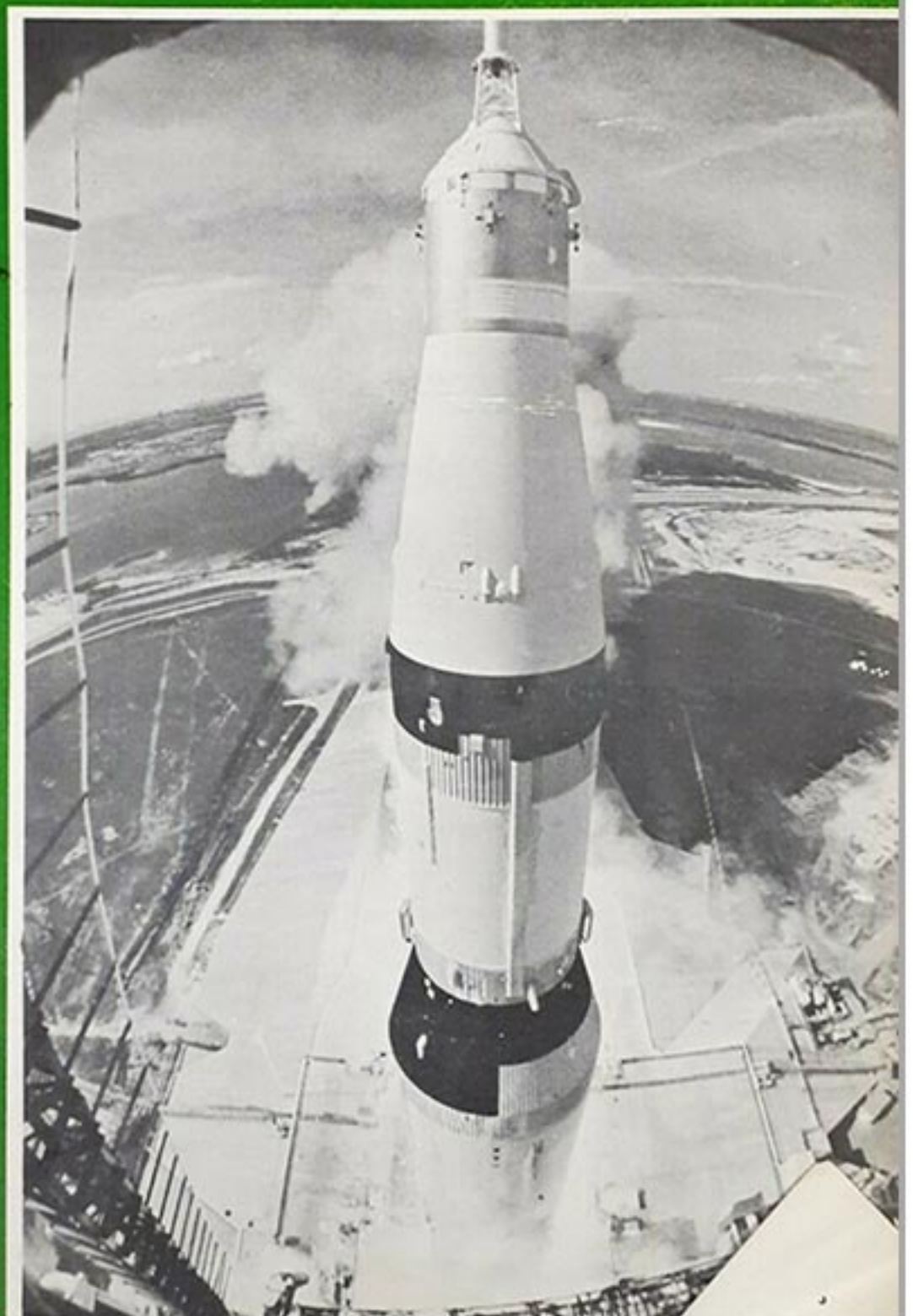


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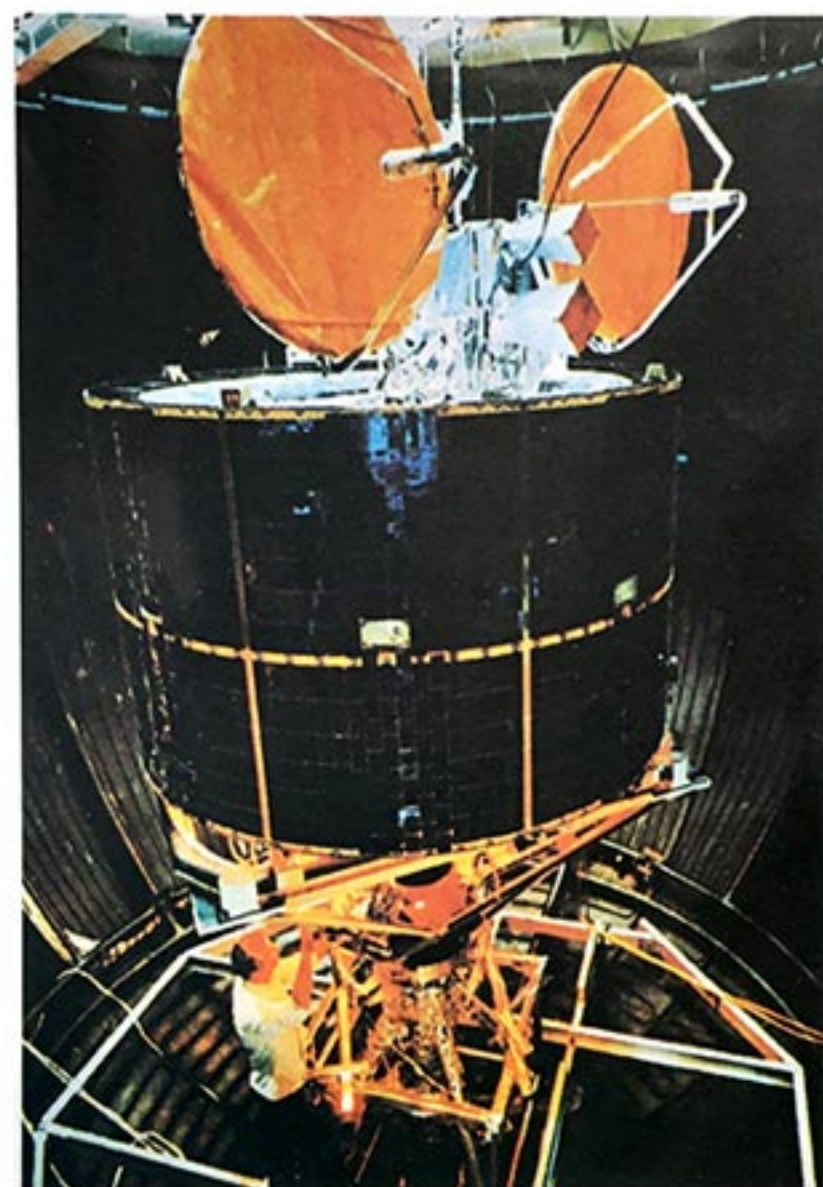
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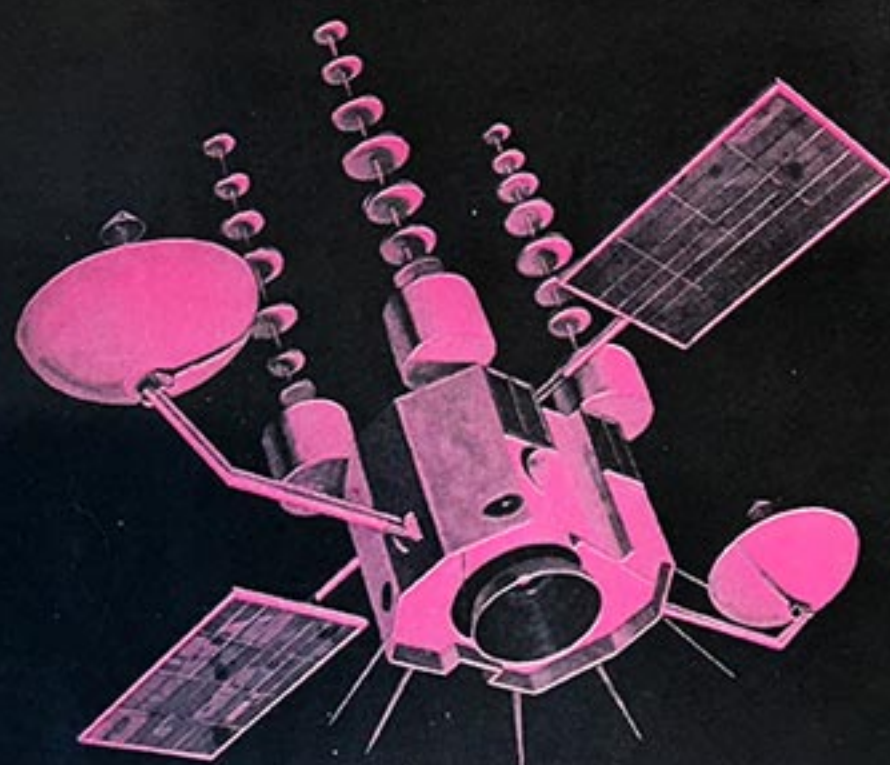
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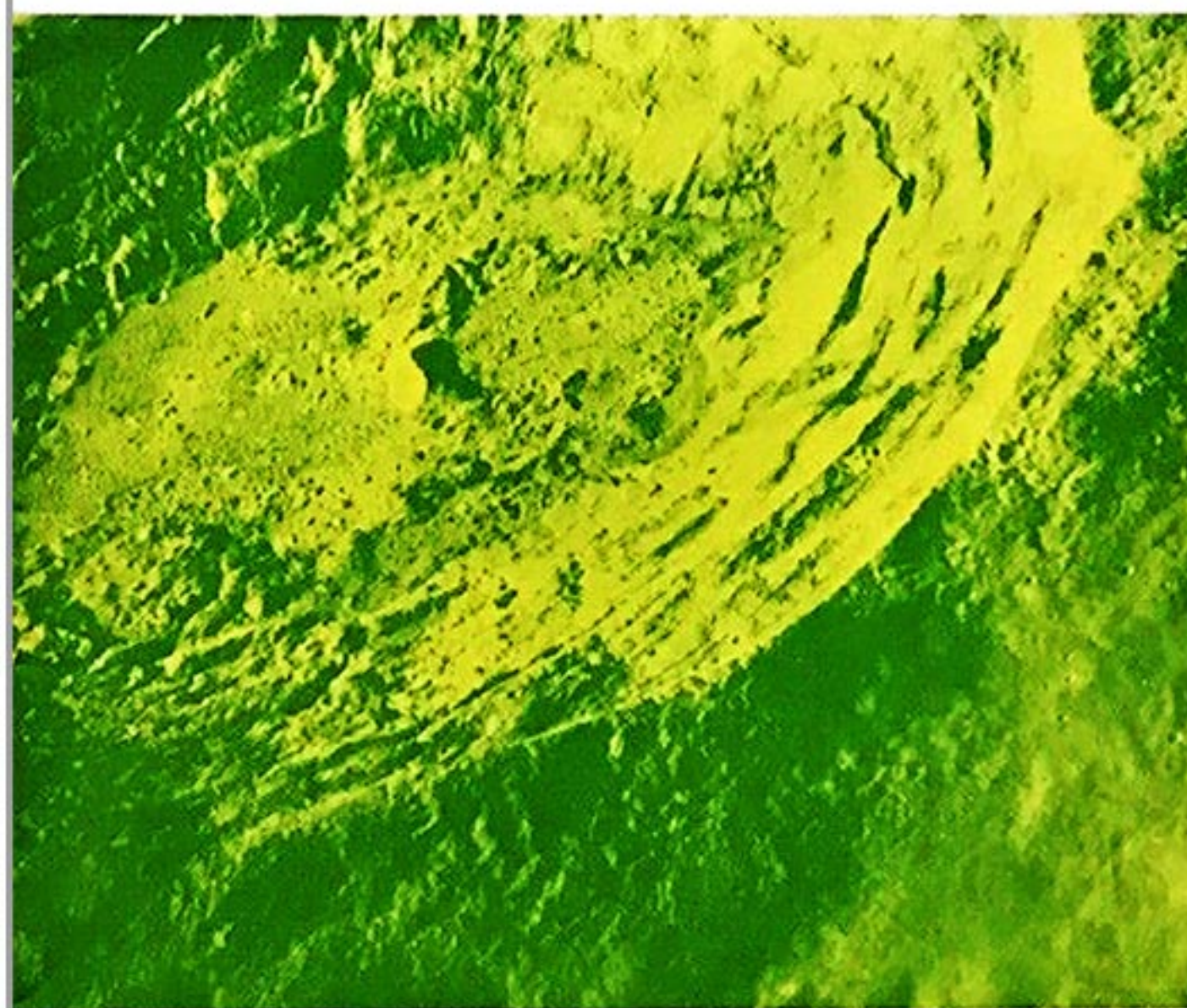
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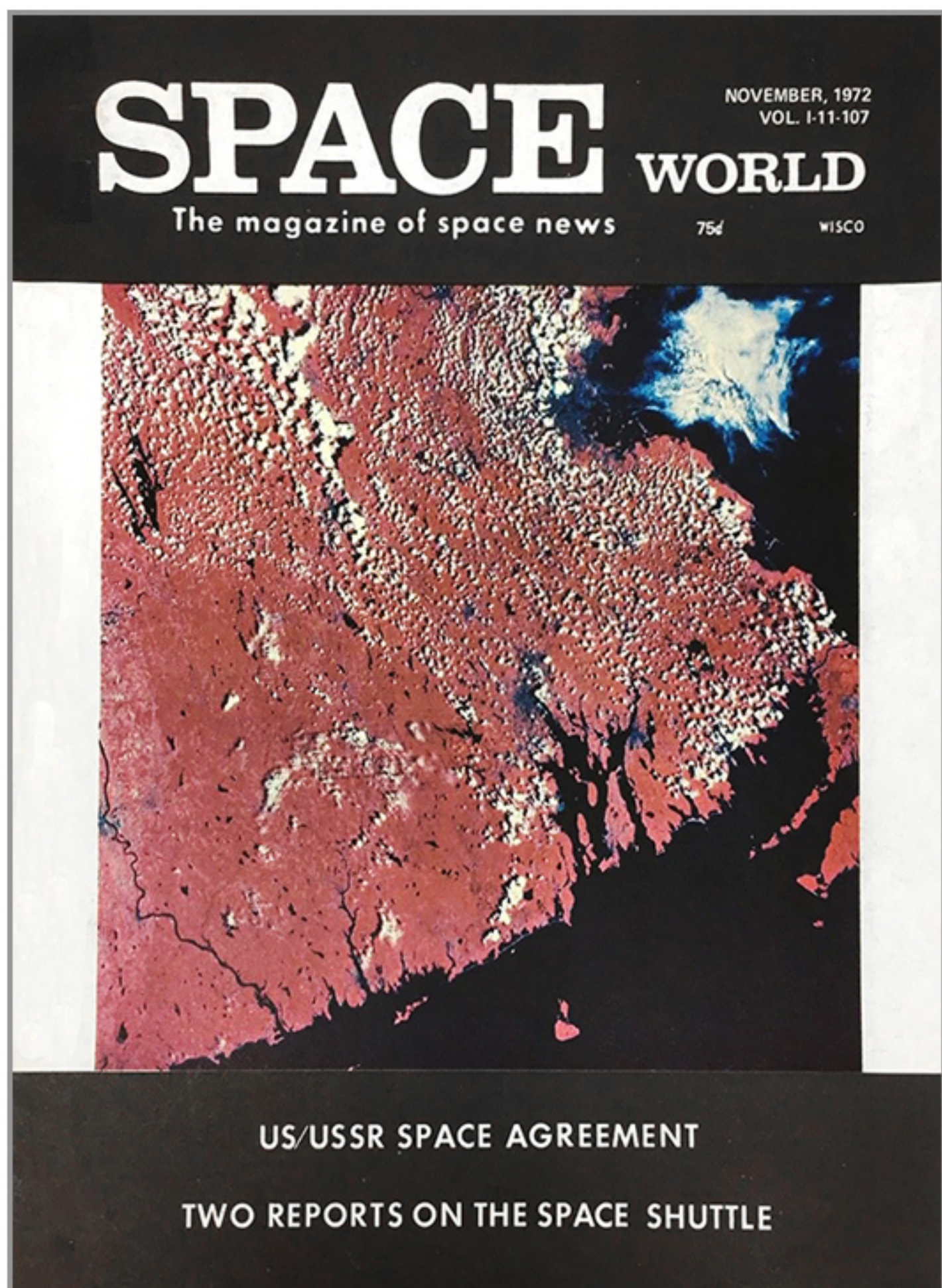
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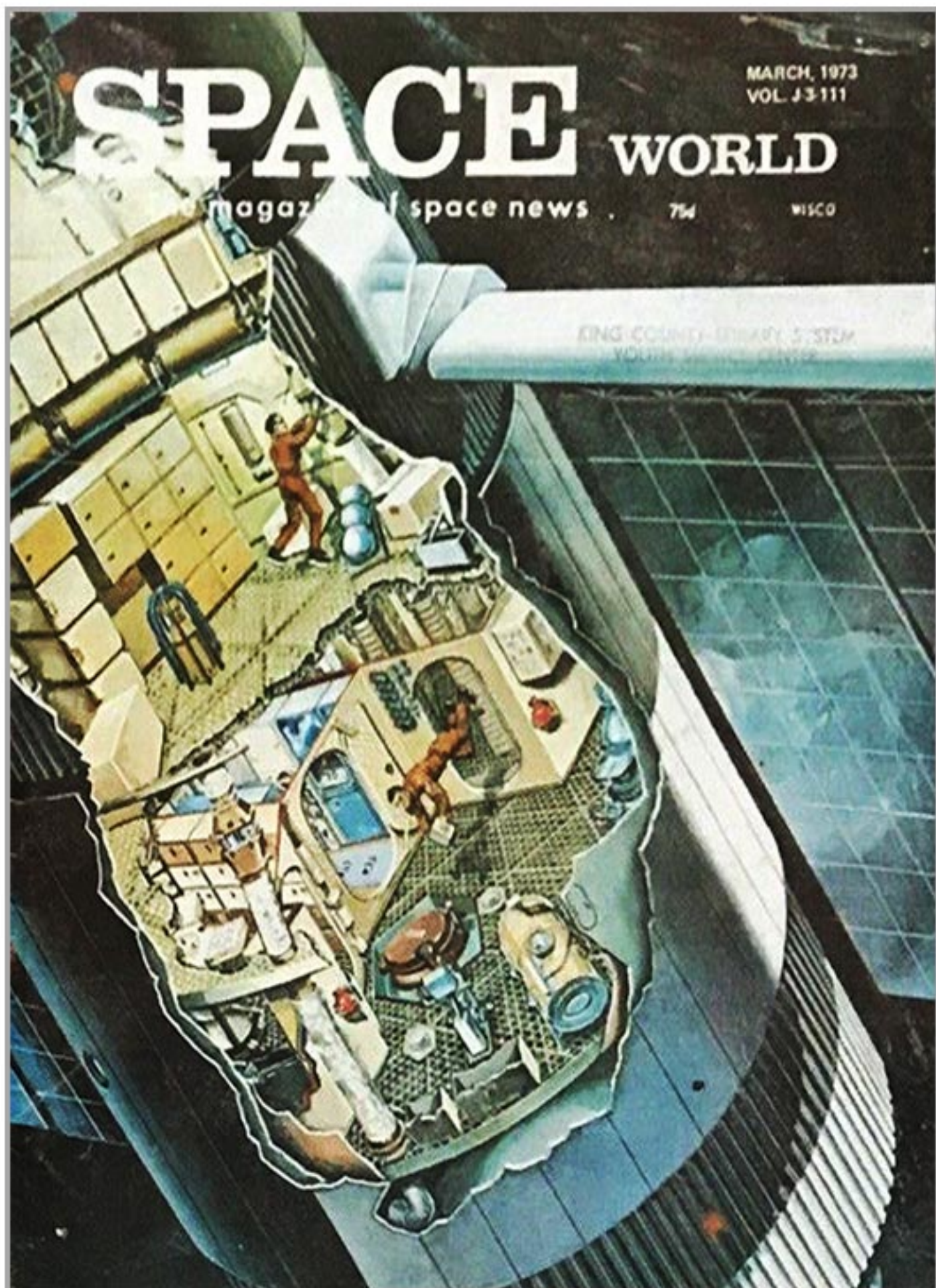
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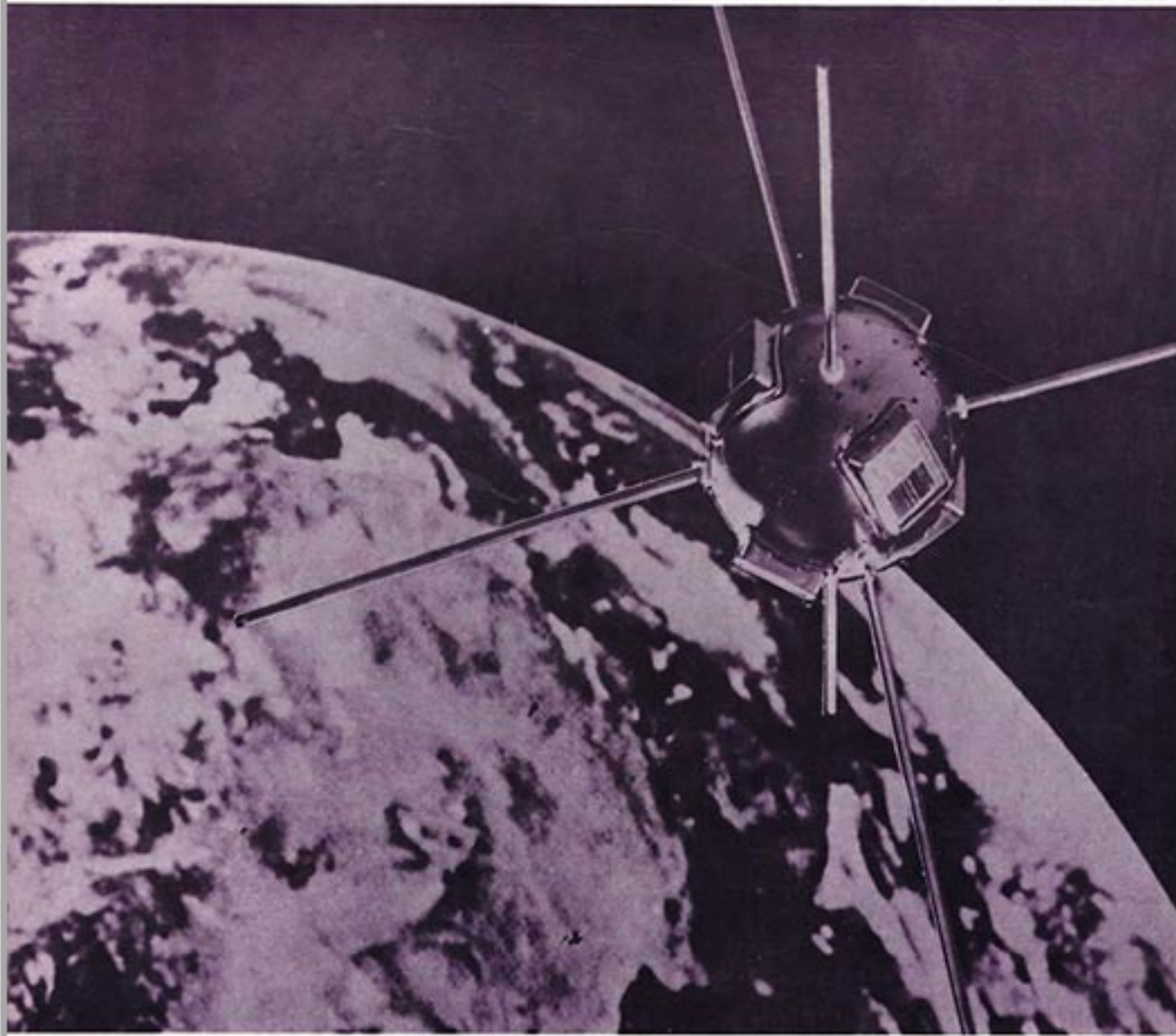
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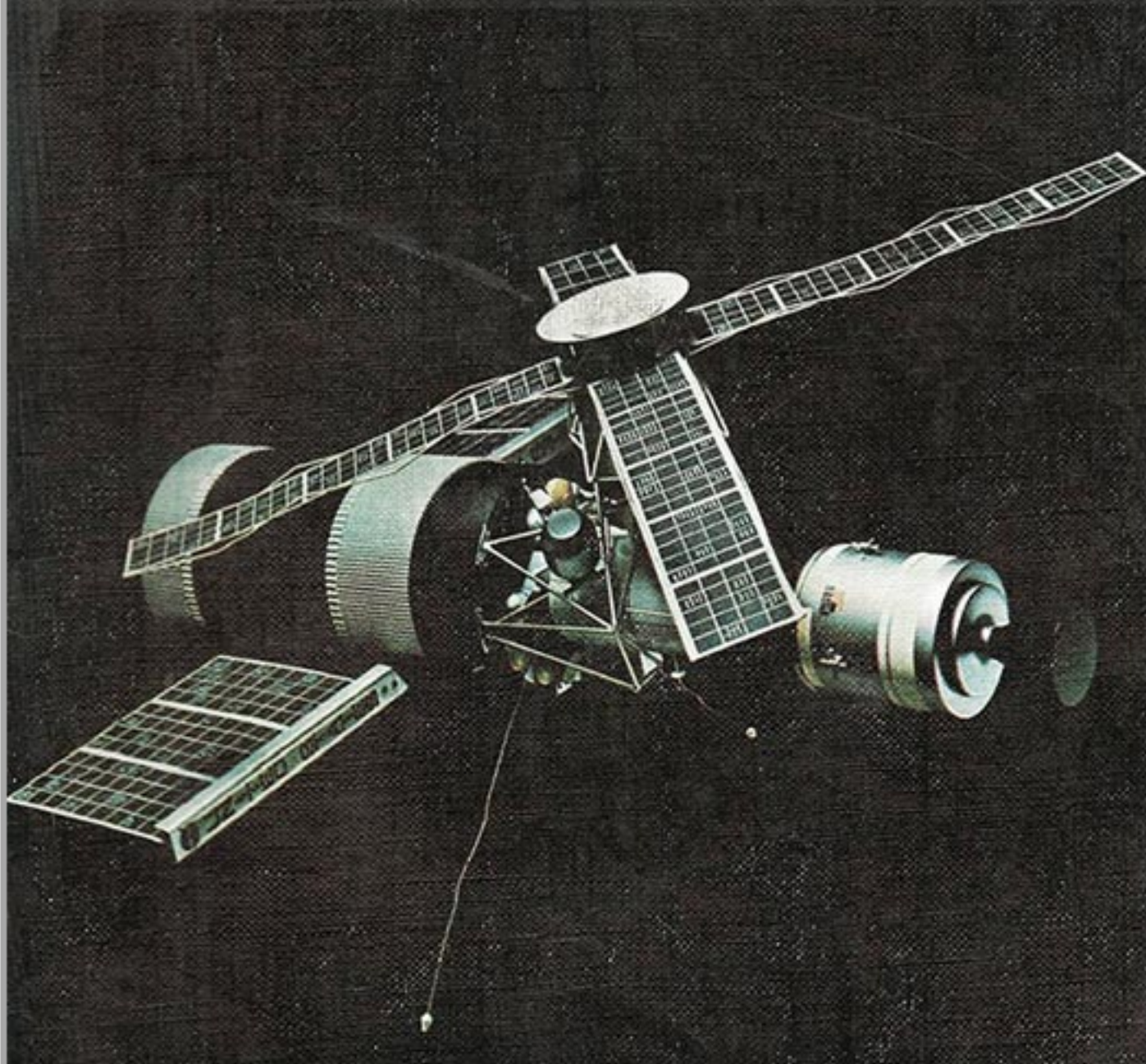
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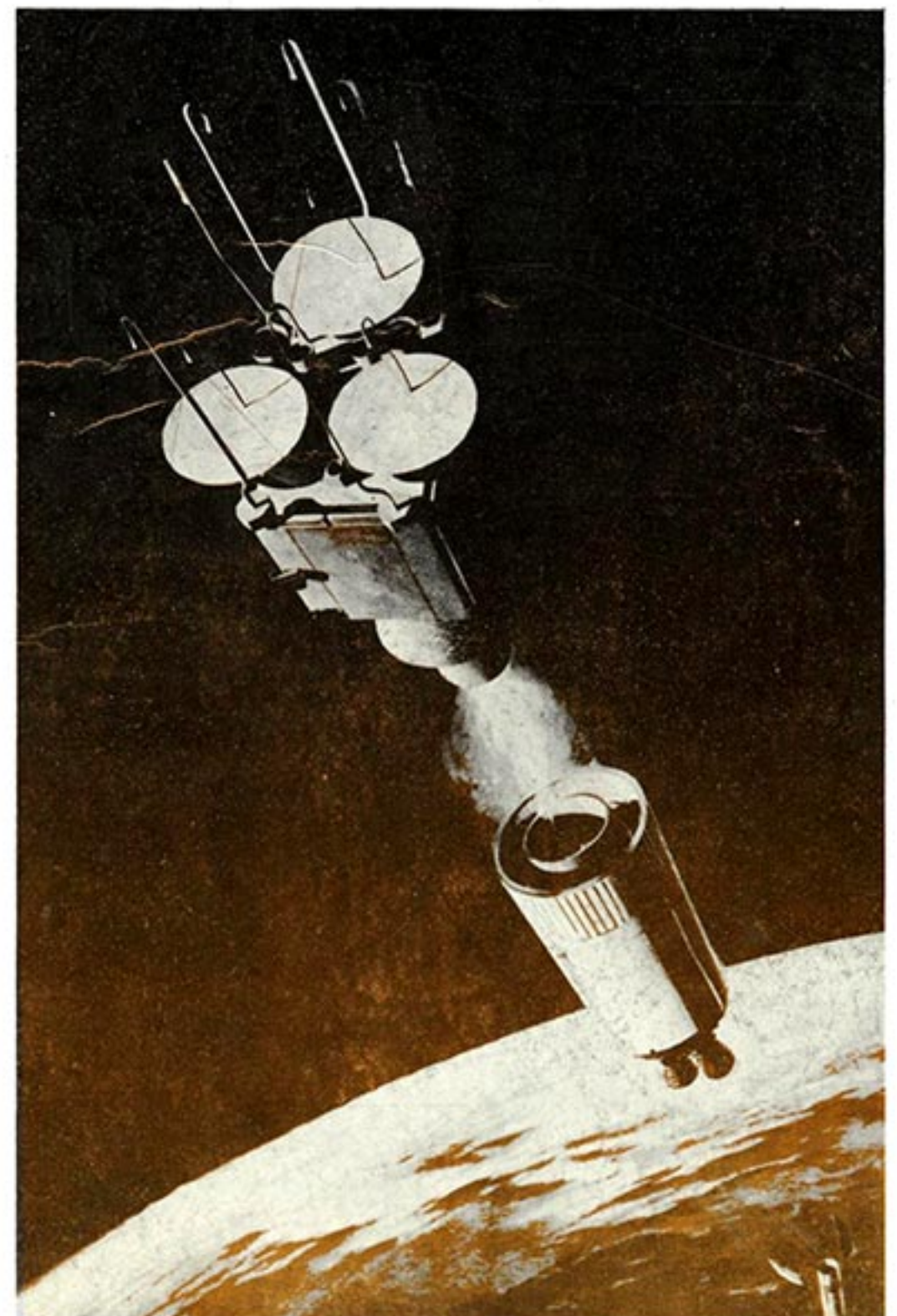
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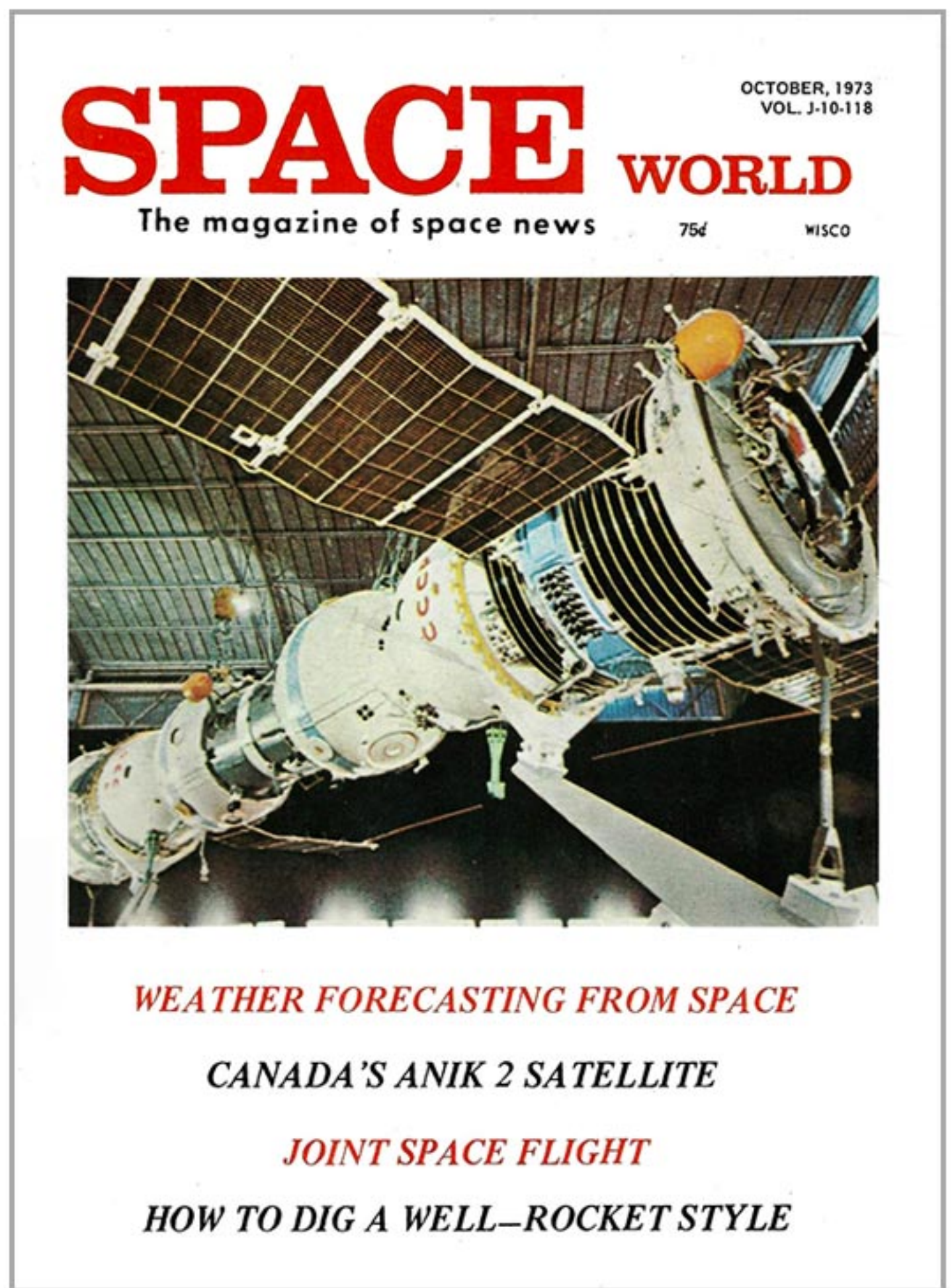
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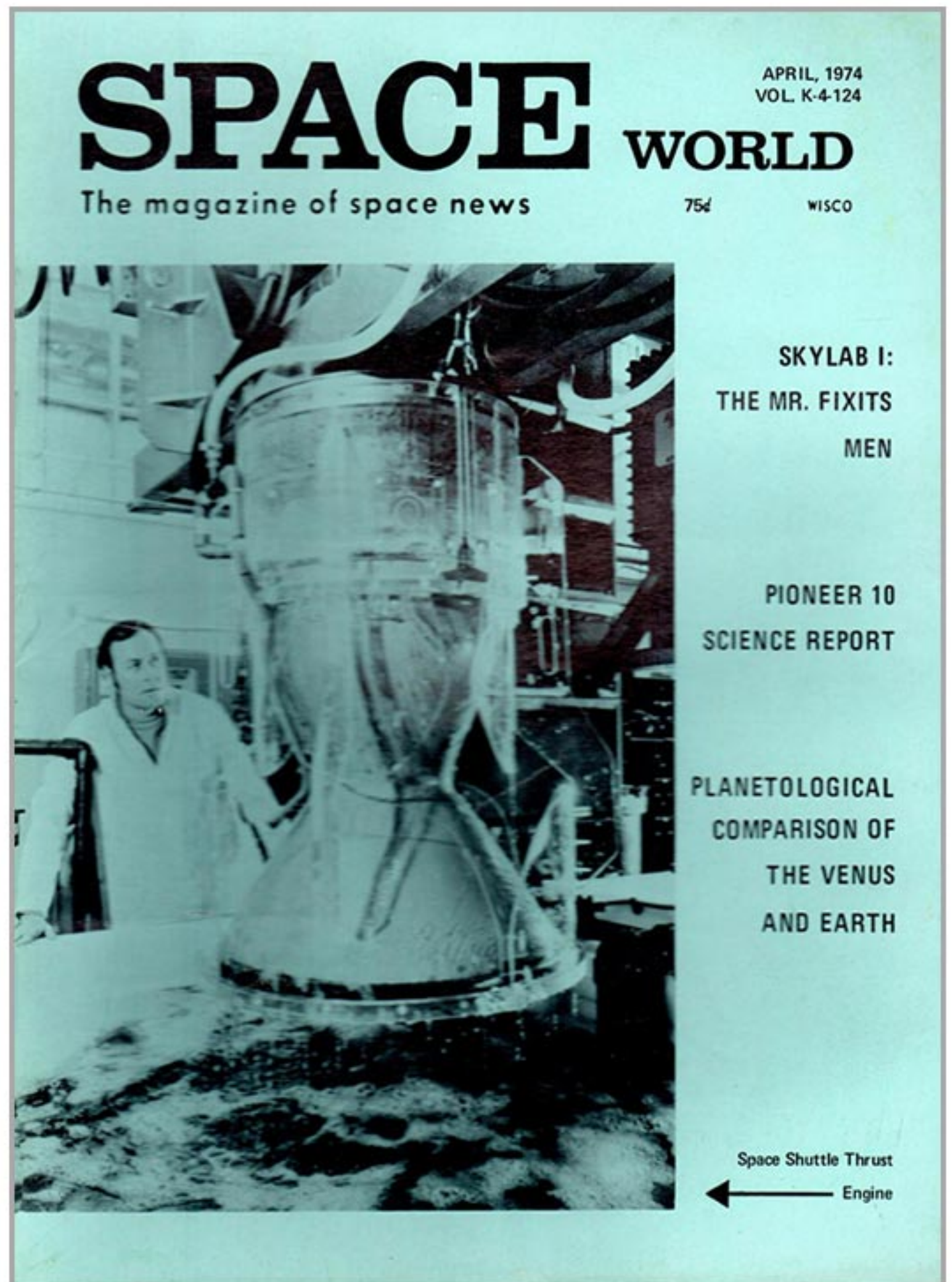
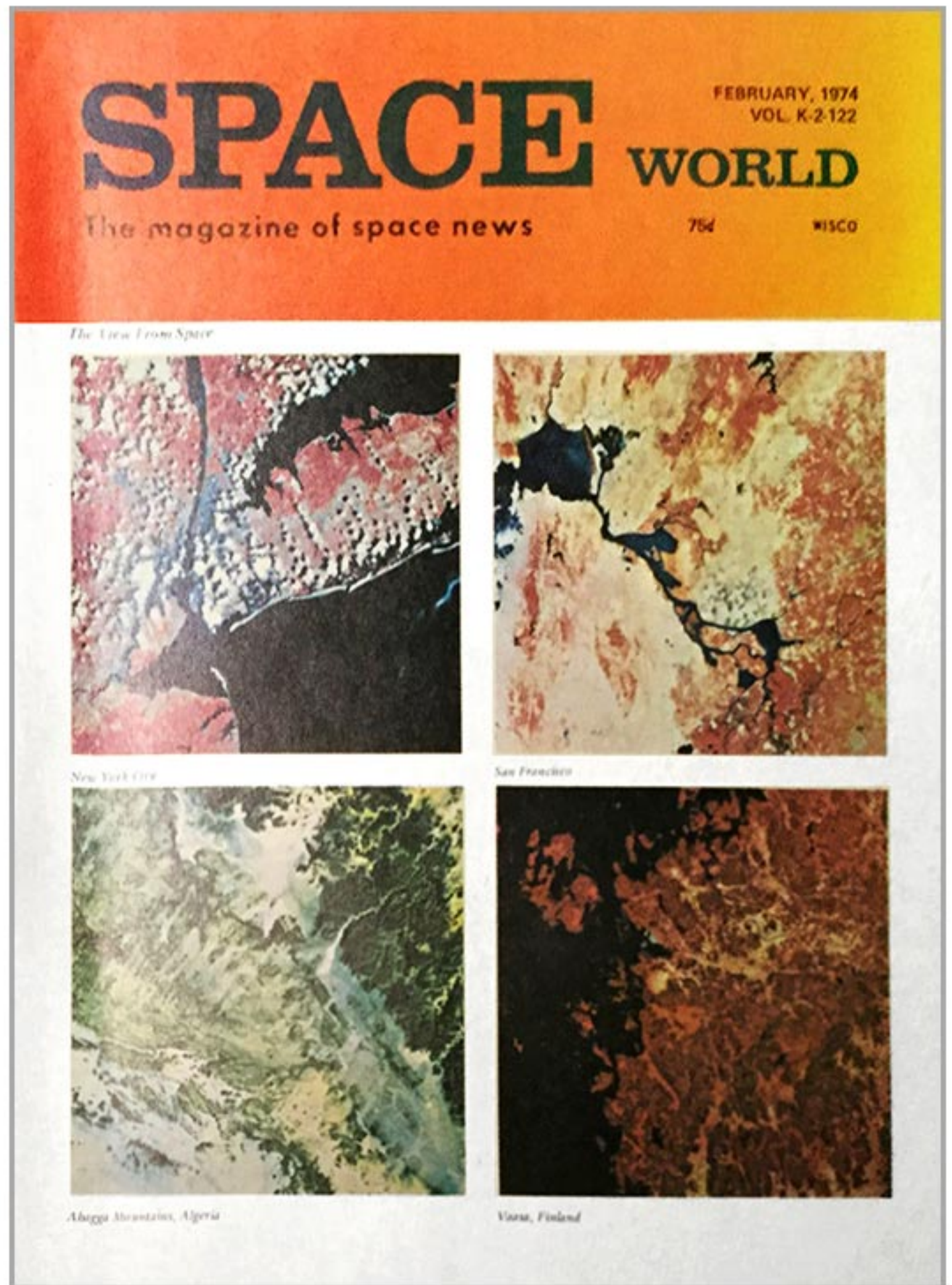




**SPACE** **WORLD**

1974







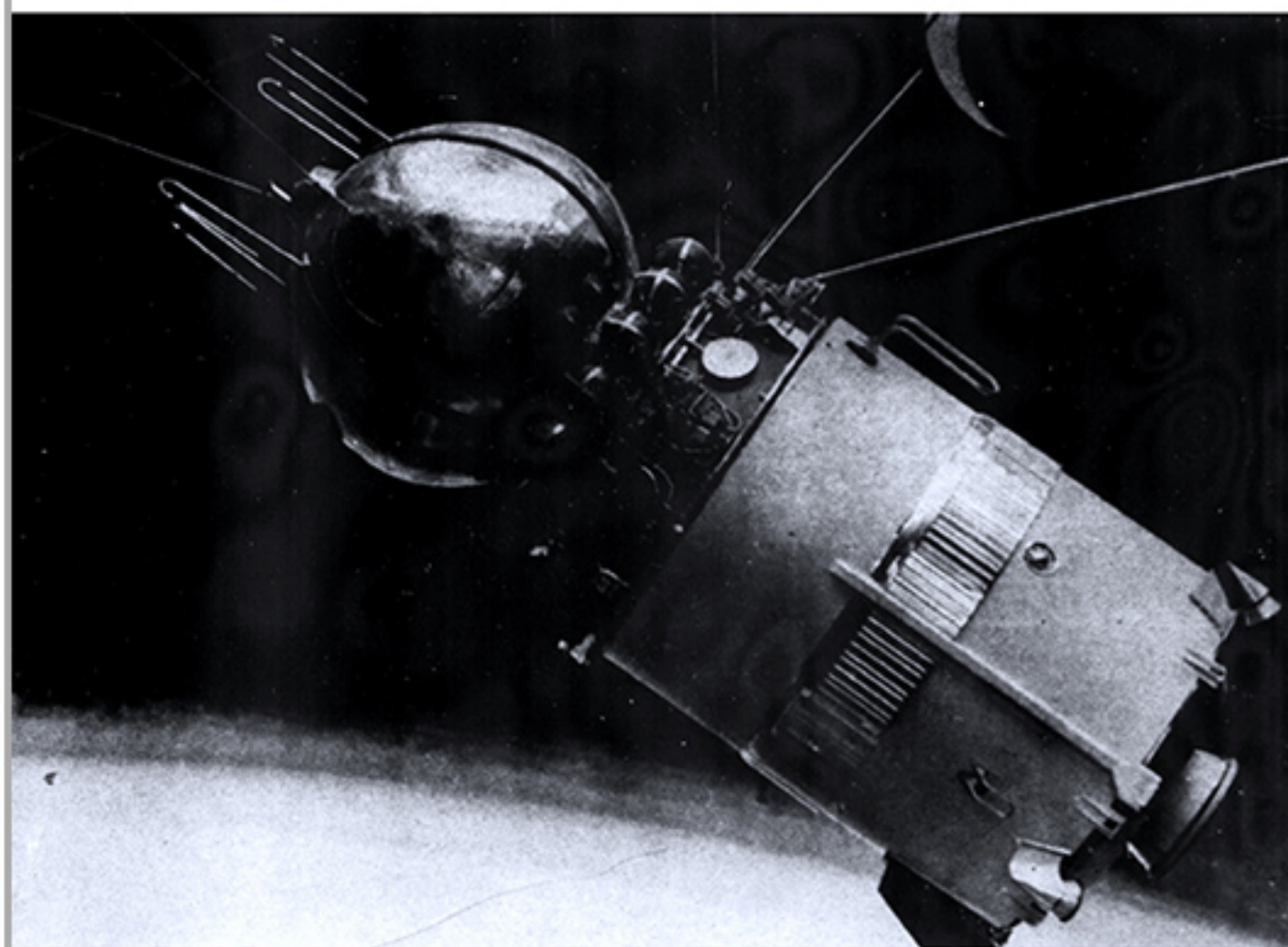
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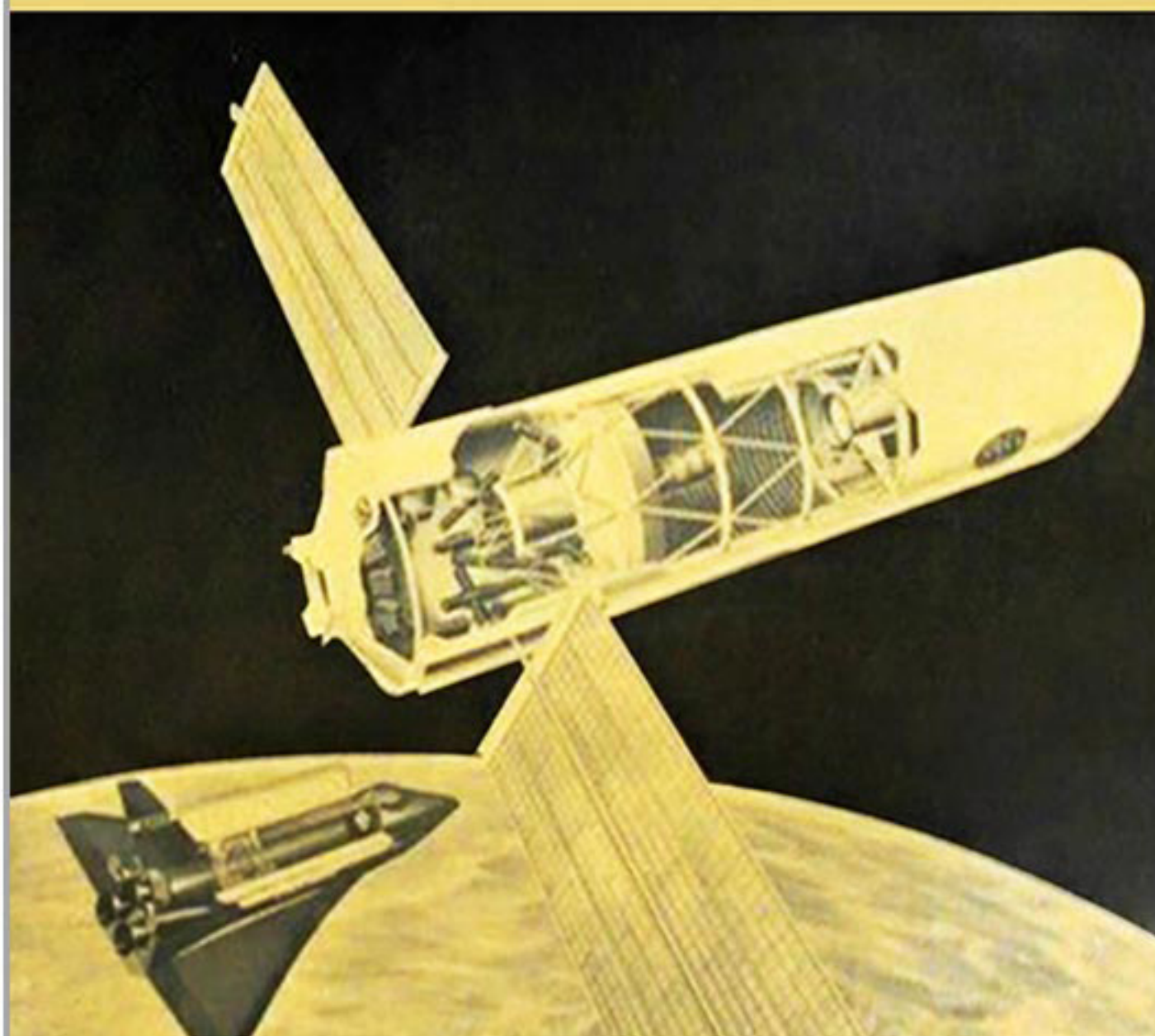
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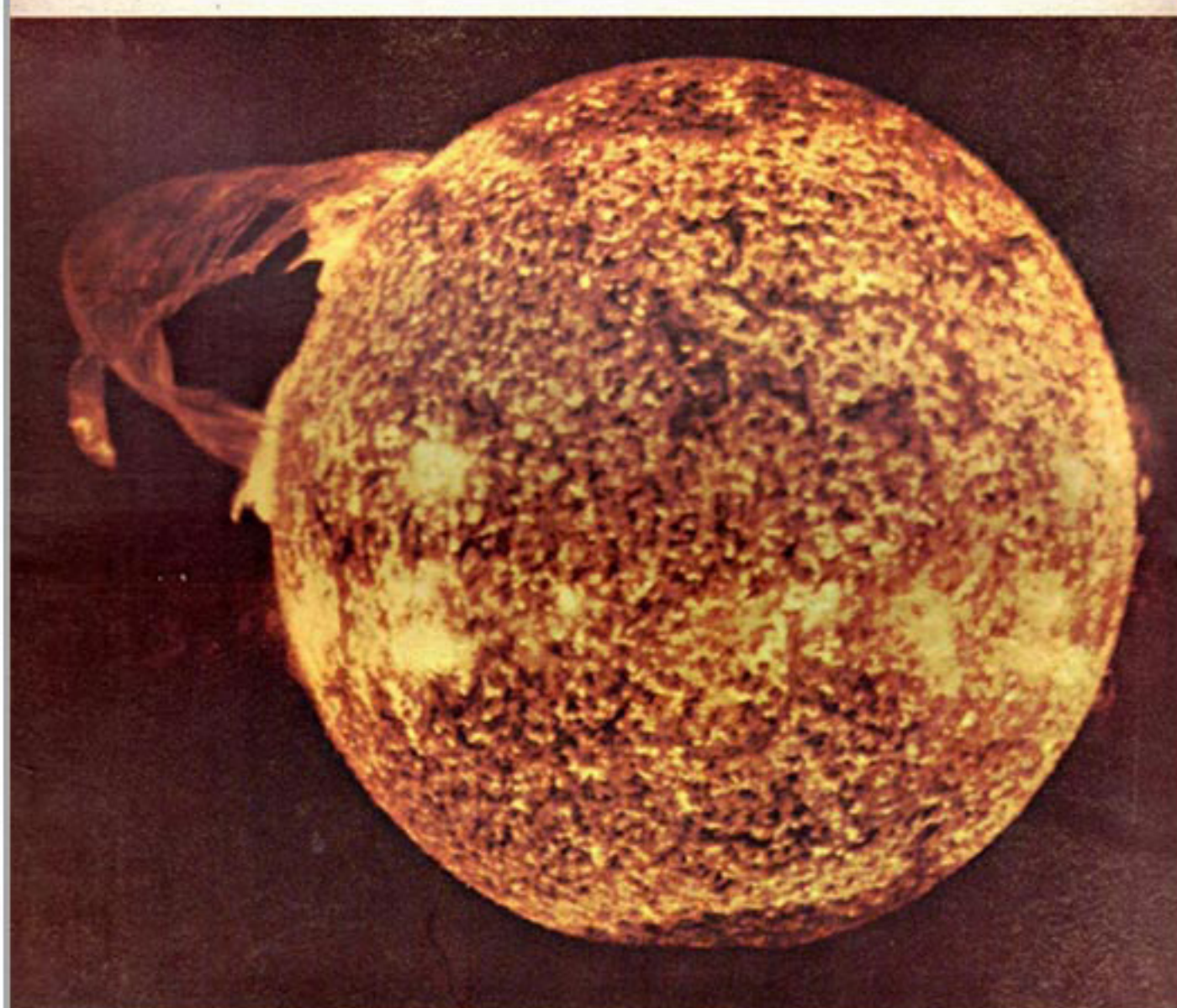
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**VENUS HOLDS CLUES TO EARTH'S WEATHER**



**SPACE** WORLD

1975



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JANUARY, 1975  
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LAKES HURON AND ST. CLAIR

This picture of Lakes Huron and St. Clair on the Michigan-Canadian border obtained by the Earth Resources Technology Satellite-1 on April 14, 1973, is an example of turbidity variations which can be easily spotted in detail from ERTS. The variations are caused by suspended sediments, organic pollutants or algae material that cause relative variations in color or reflectance of the water. In addition, the eddies and currents seen in the imagery give clues as to where shoreline erosion is occurring. Lake Huron is the large body of water at the top and Lake St. Clair, connected to Lake Huron by the St. Clair River, is at the bottom. Canada is to the right of the river and Michigan to the left.

(story on page 4)

This Earth Resources Technology Satellite-1 (ERTS-1) picture of the Bering Glacier in Central Alaska obtained September 22, 1972, shows how glaciers (nearly 80% of the world's fresh water is contained in glaciers and icecaps) can be monitored from spacecraft. The Bering Glacier is the largest on the North American continent and is about 200 kilometers (124 miles) long. Note the wiggly or folded moraines (areas of trapped dirt and debris) which characterizes it as a surging glacier. Surging glaciers occasionally block and suddenly release large amounts of melt water resulting in floods. Sediment plumes extend out some tens of miles into the Gulf of Alaska and come, largely, from glacial melt. These melt areas are delineated by the dark areas on the glacier, which result from the lower reflectivity of surface water standing or flowing on the surface.

BERING GLACIER



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WESTAR  
America's First  
Domestic  
Communications  
Satellite

★★★★

GOLDSTONE

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WEATHER  
FROM  
SPACE—EVERY  
30 MINUTES

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SPACE SCIENCE  
ECOLOGY AIDS

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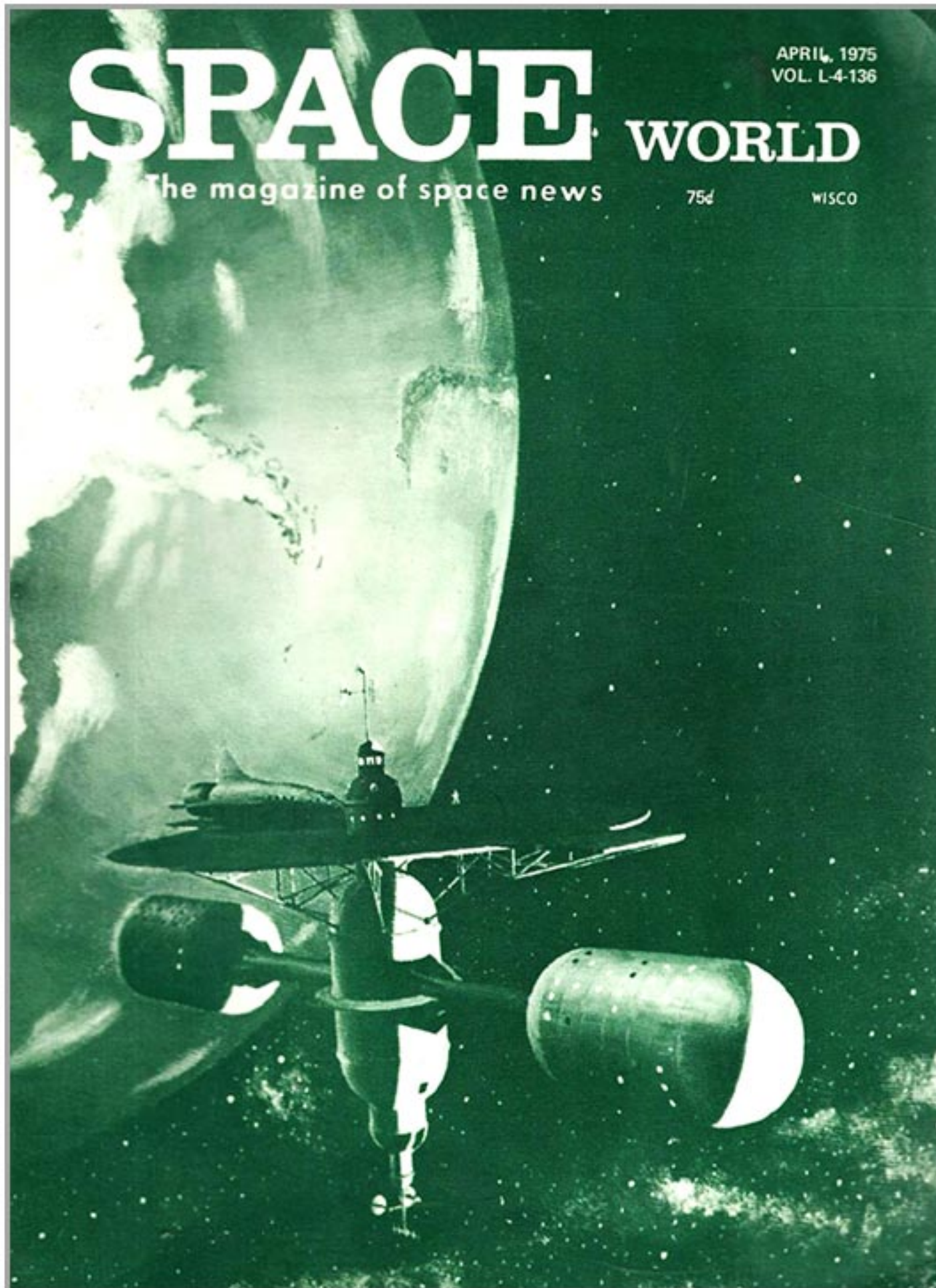


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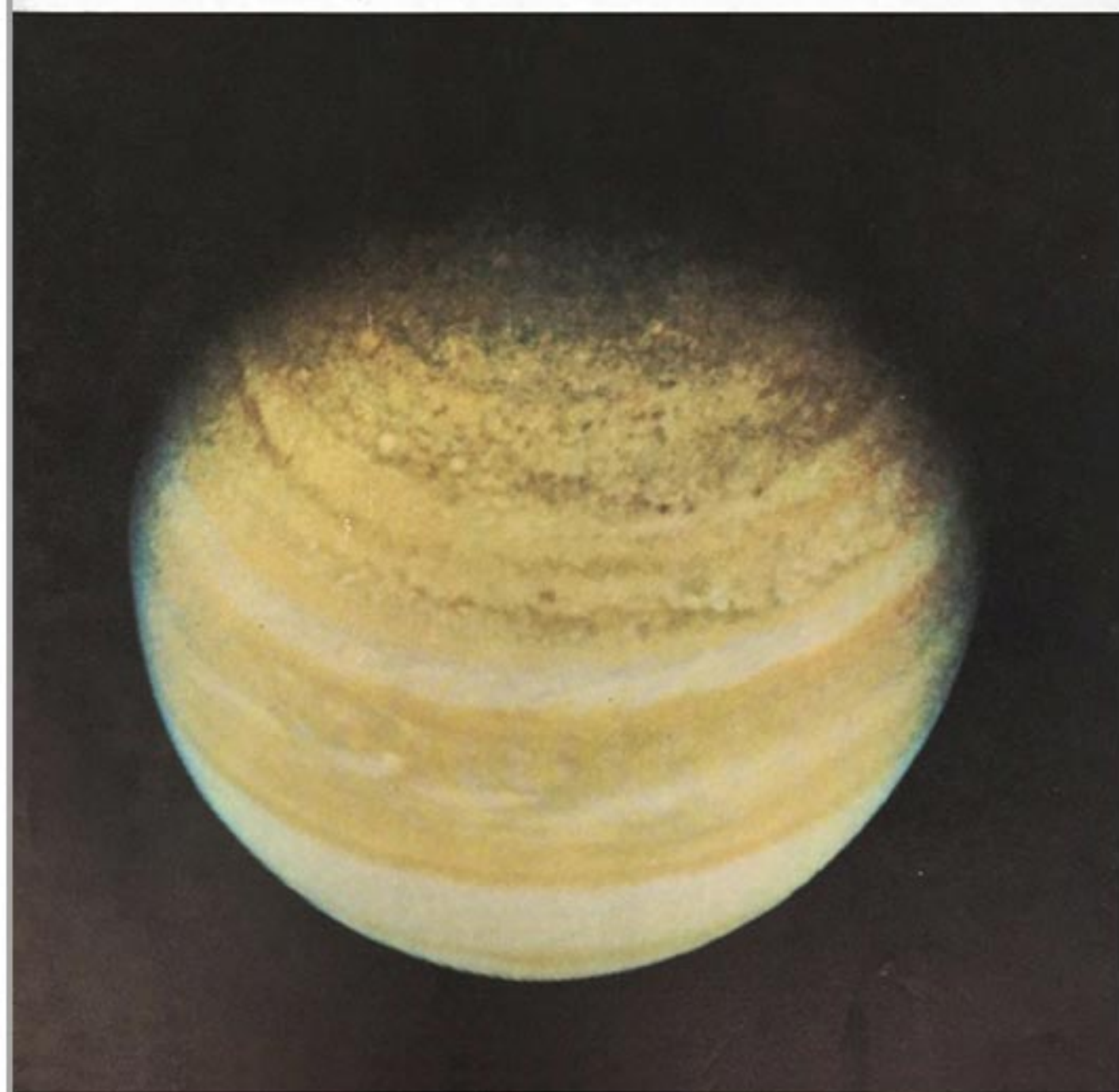
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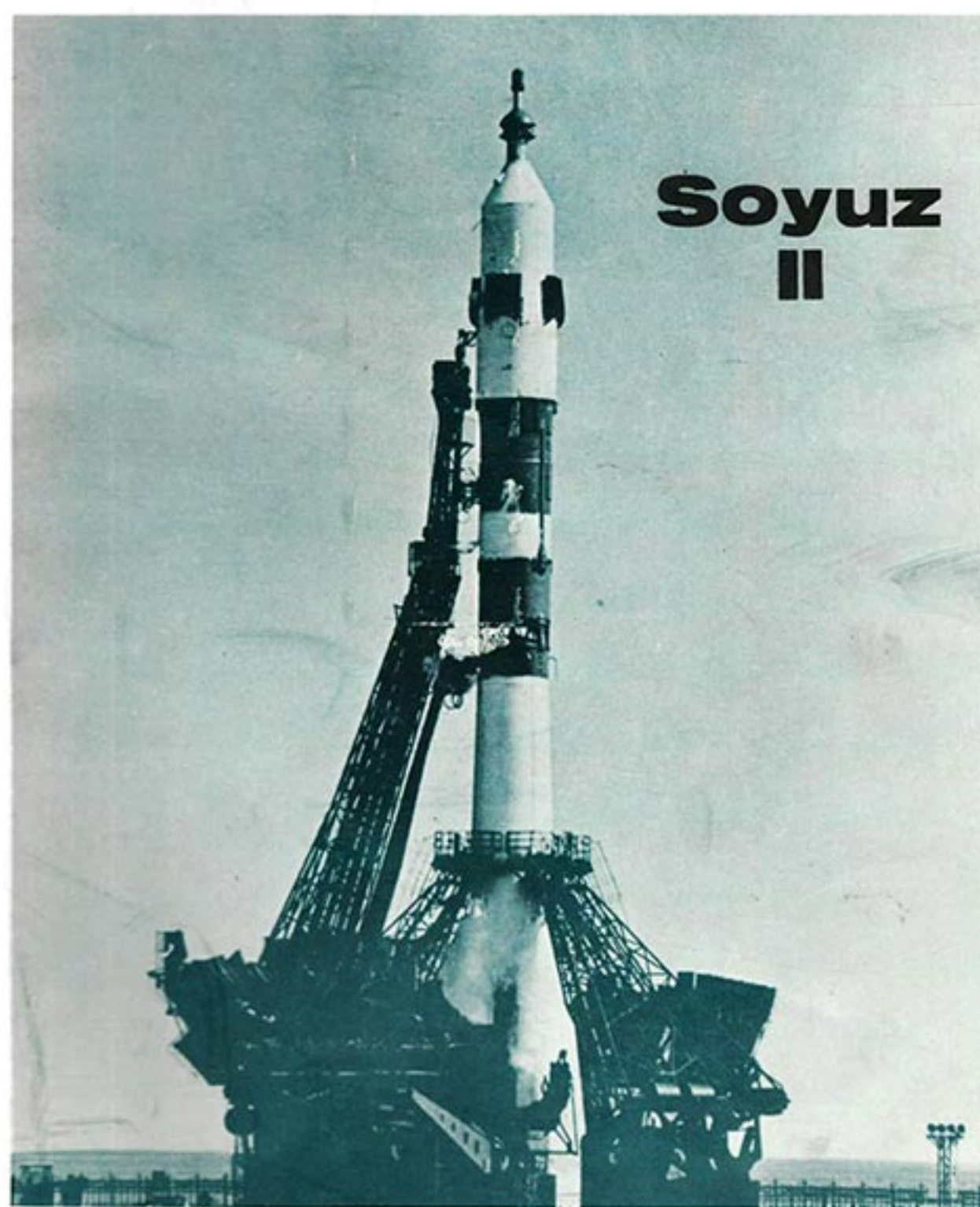
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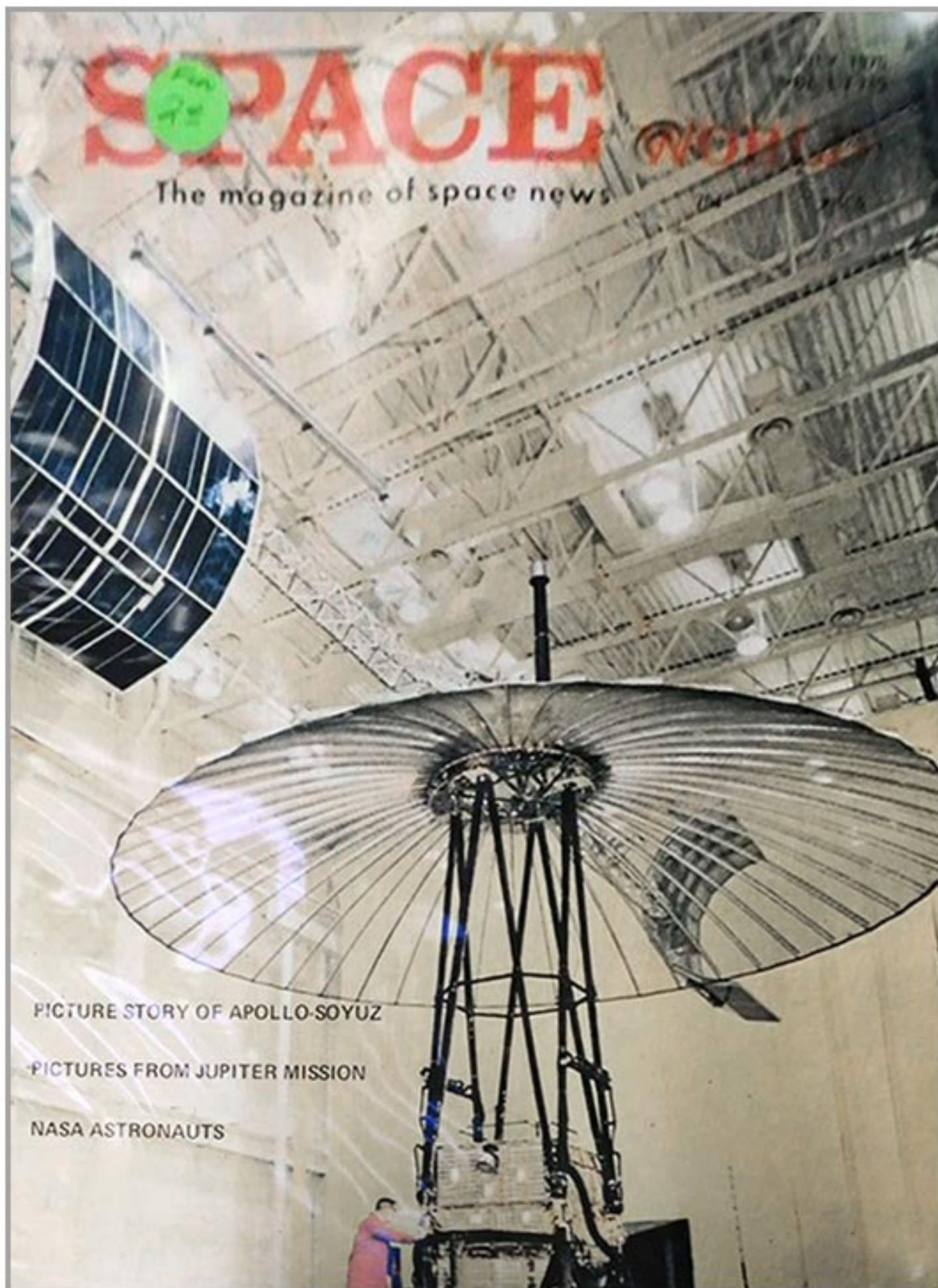
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VIKING PROGRAM

FUTURE NASA PROGRAMS



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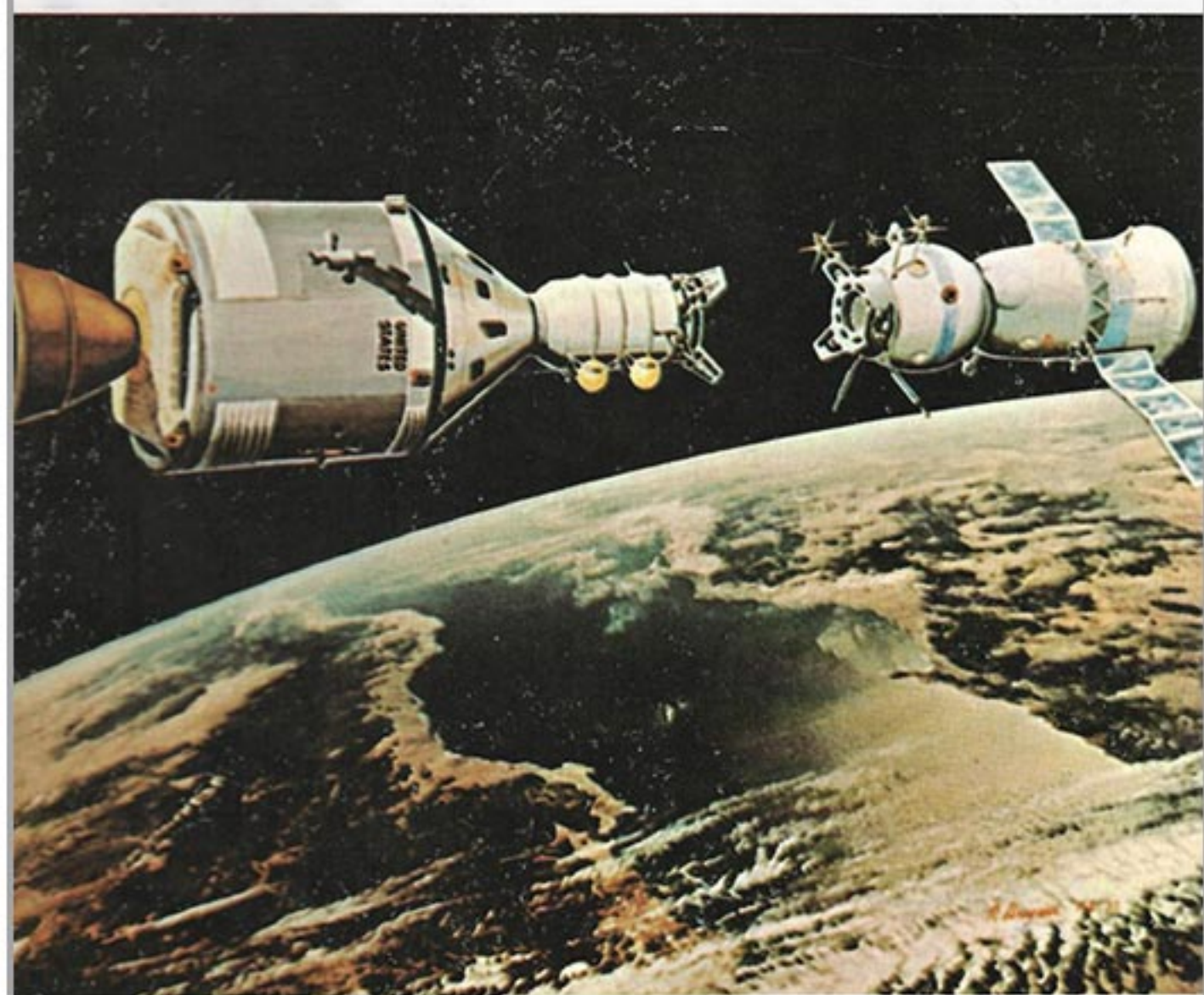
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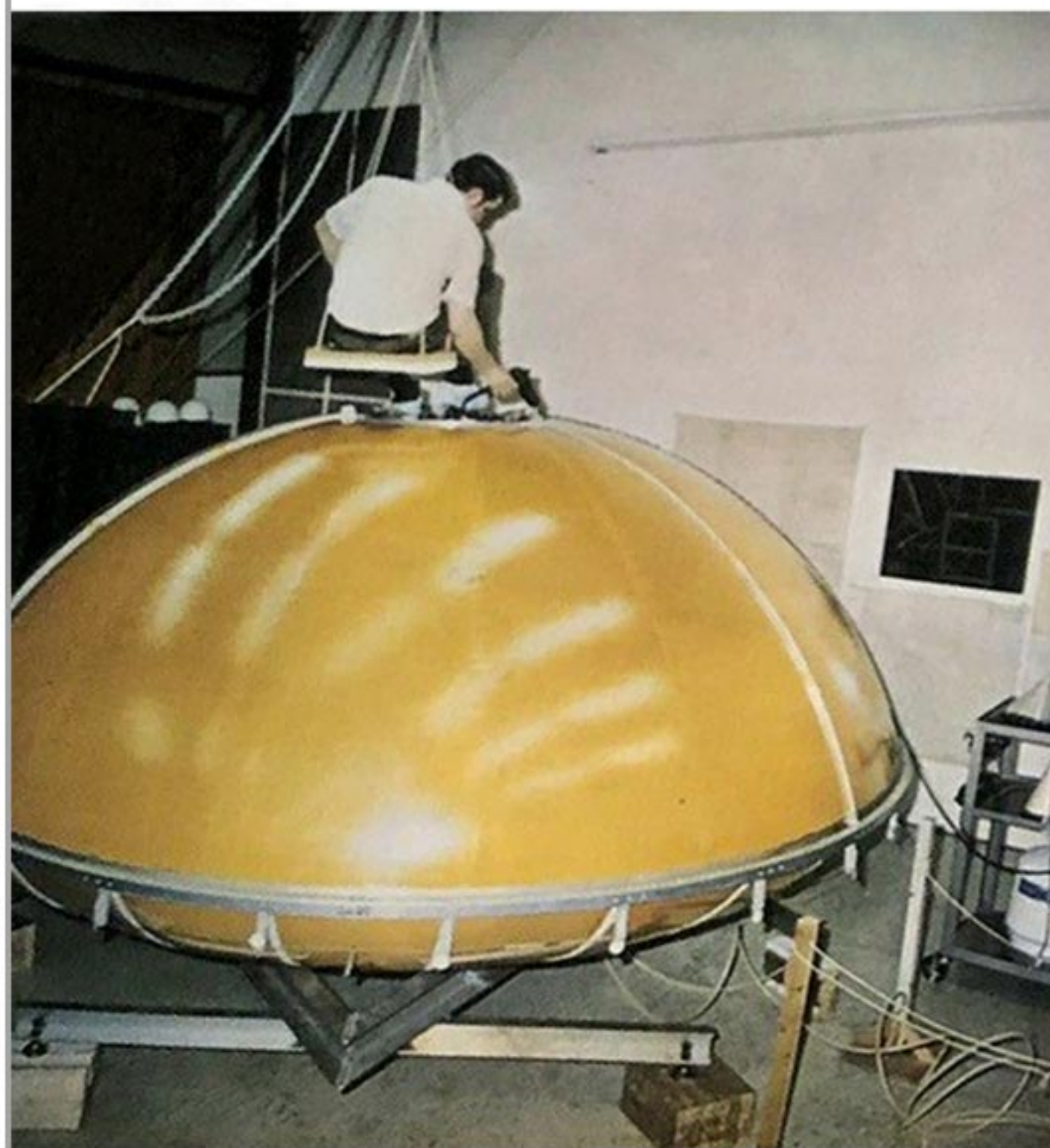
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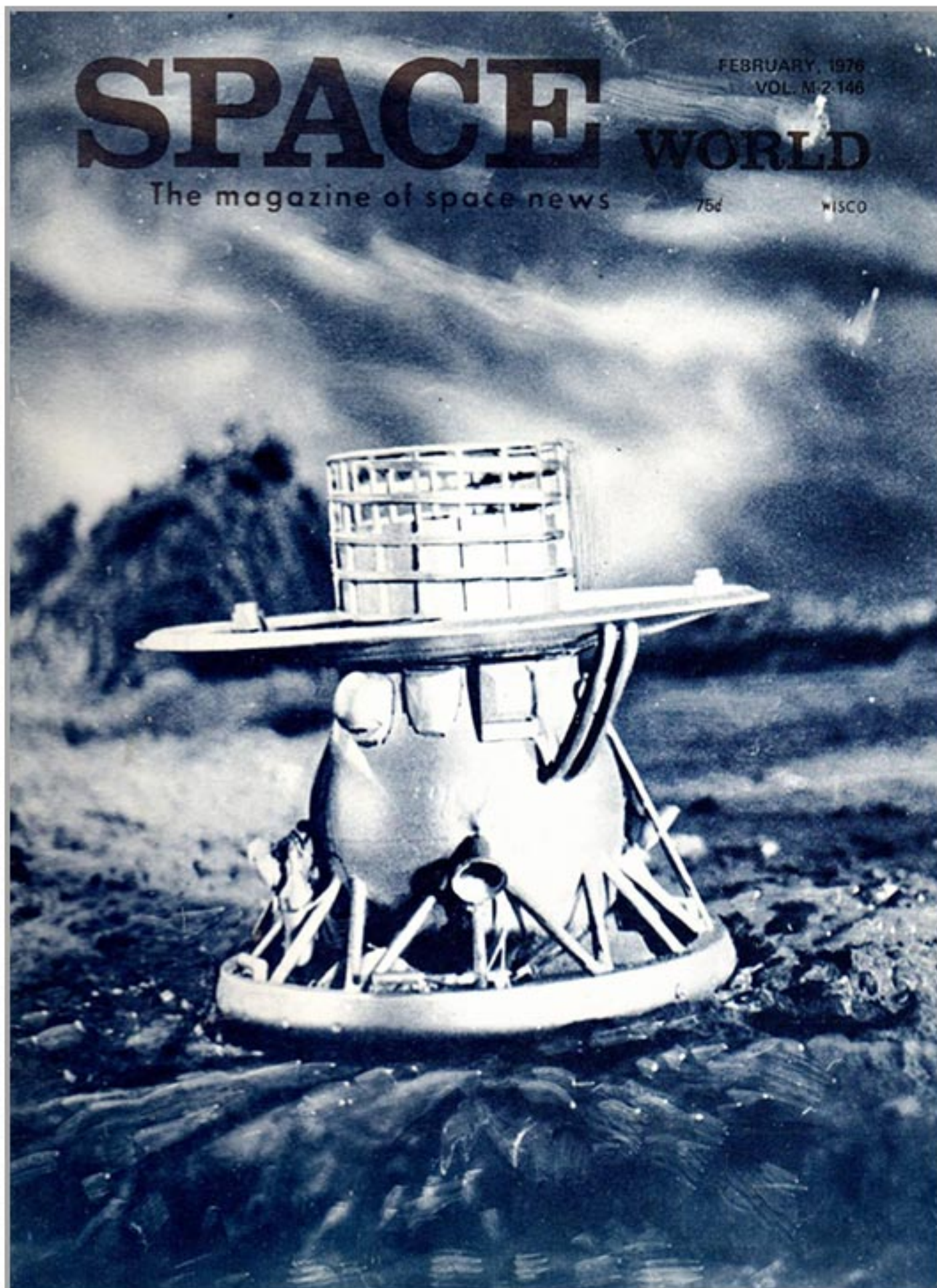
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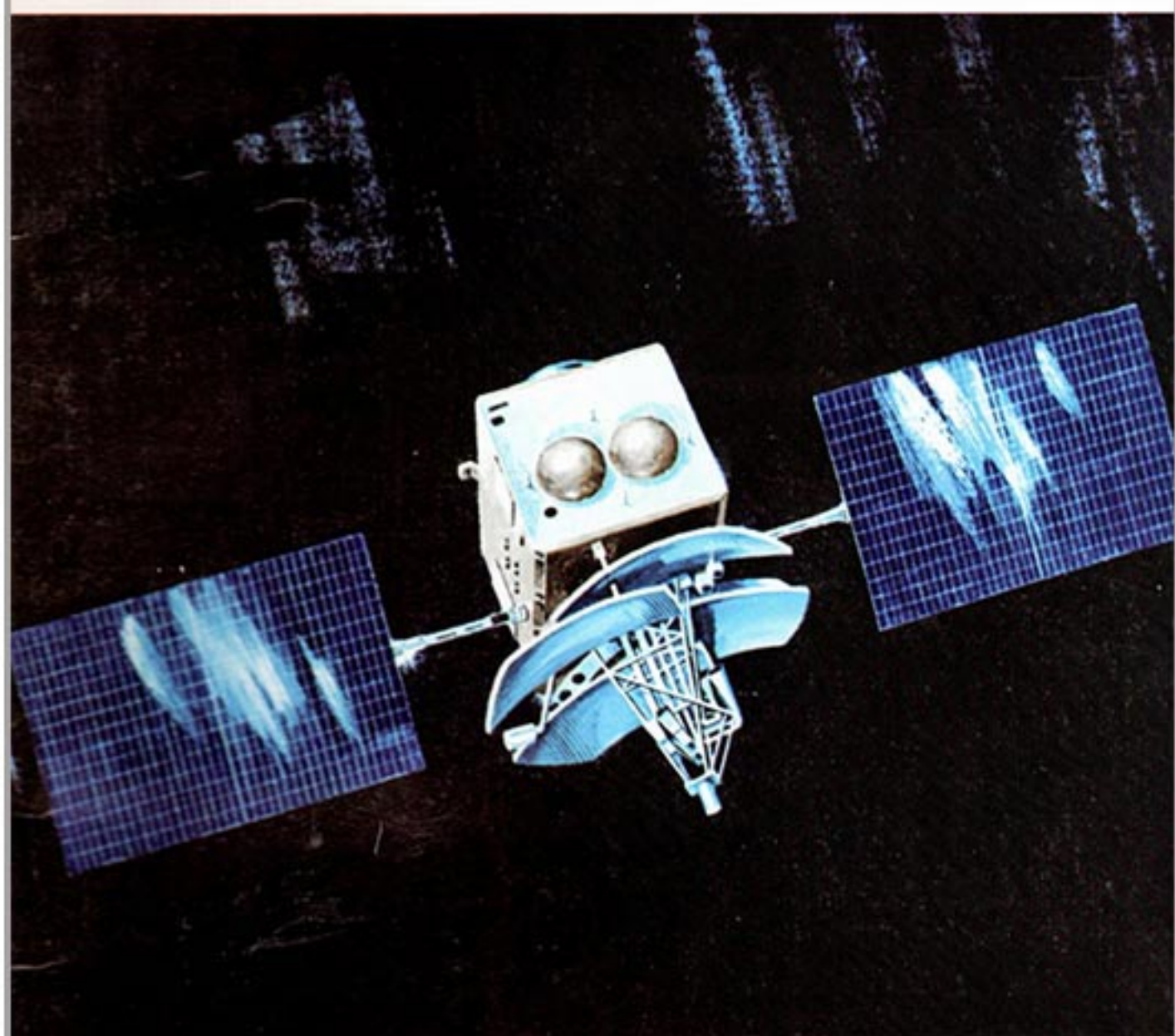


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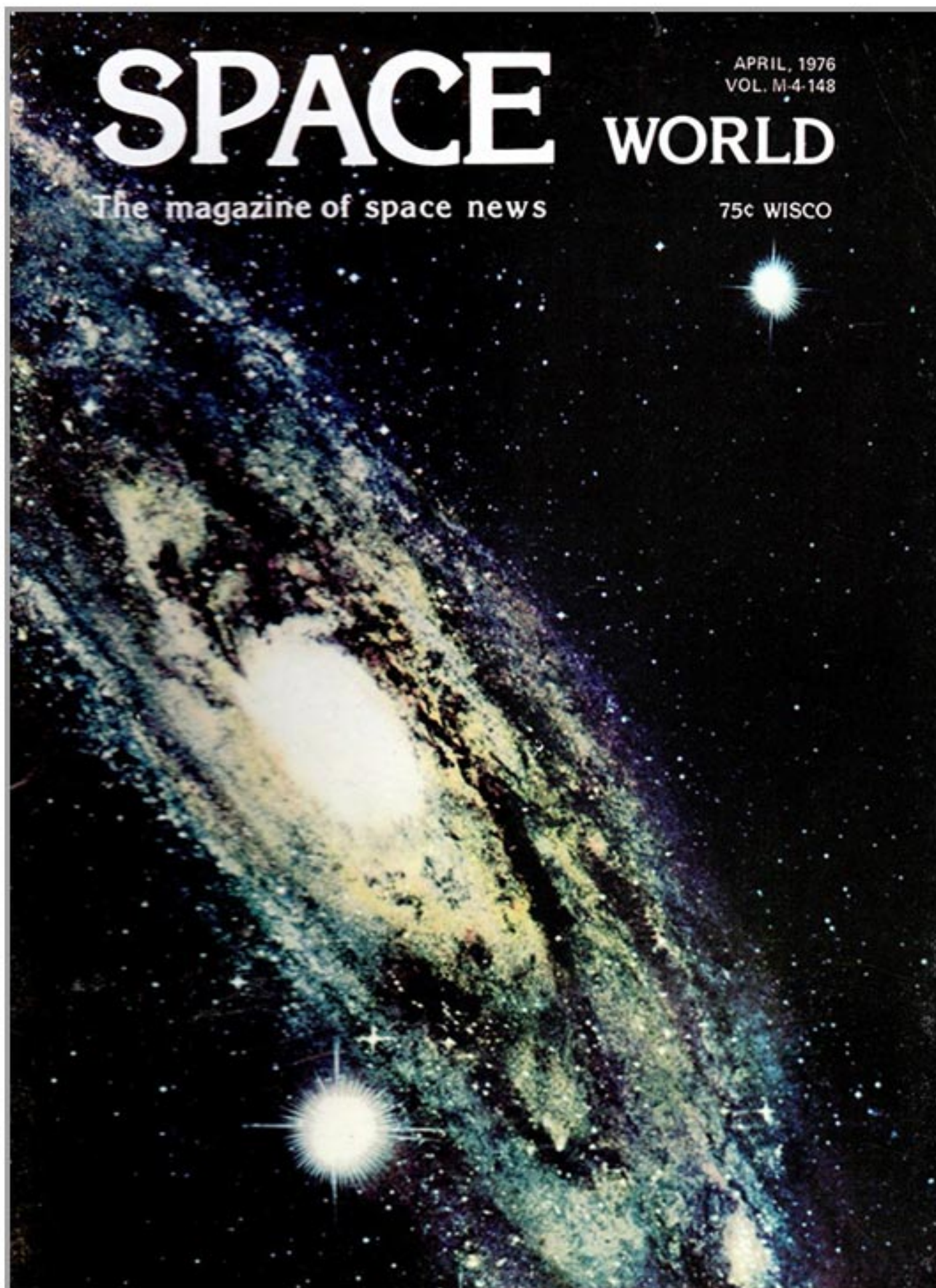
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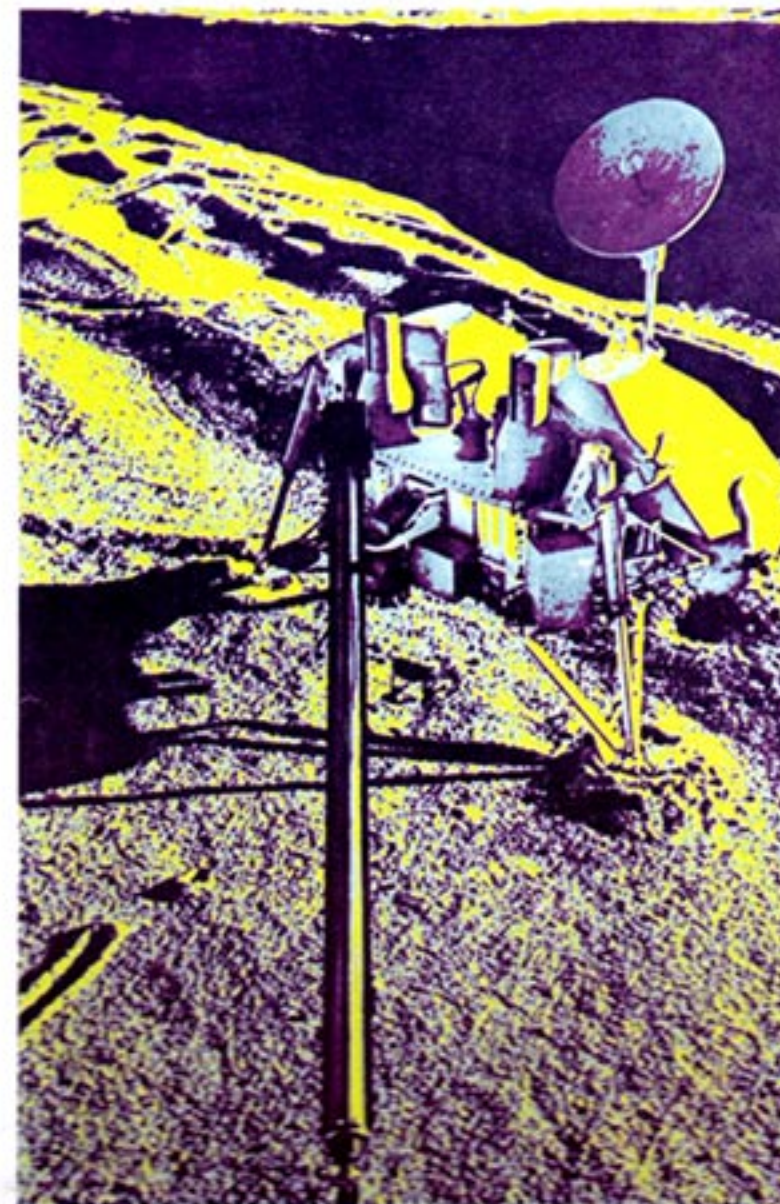
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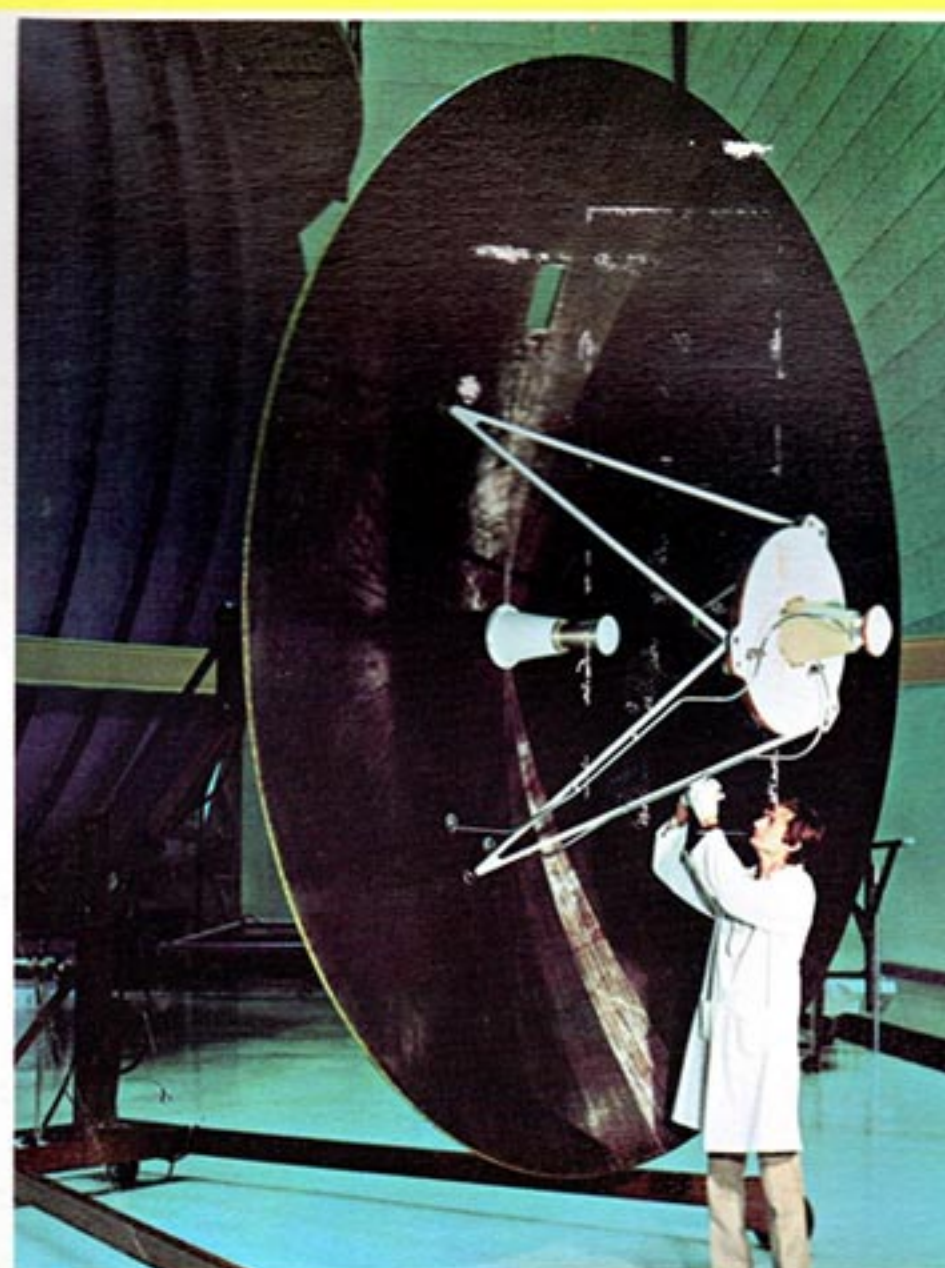


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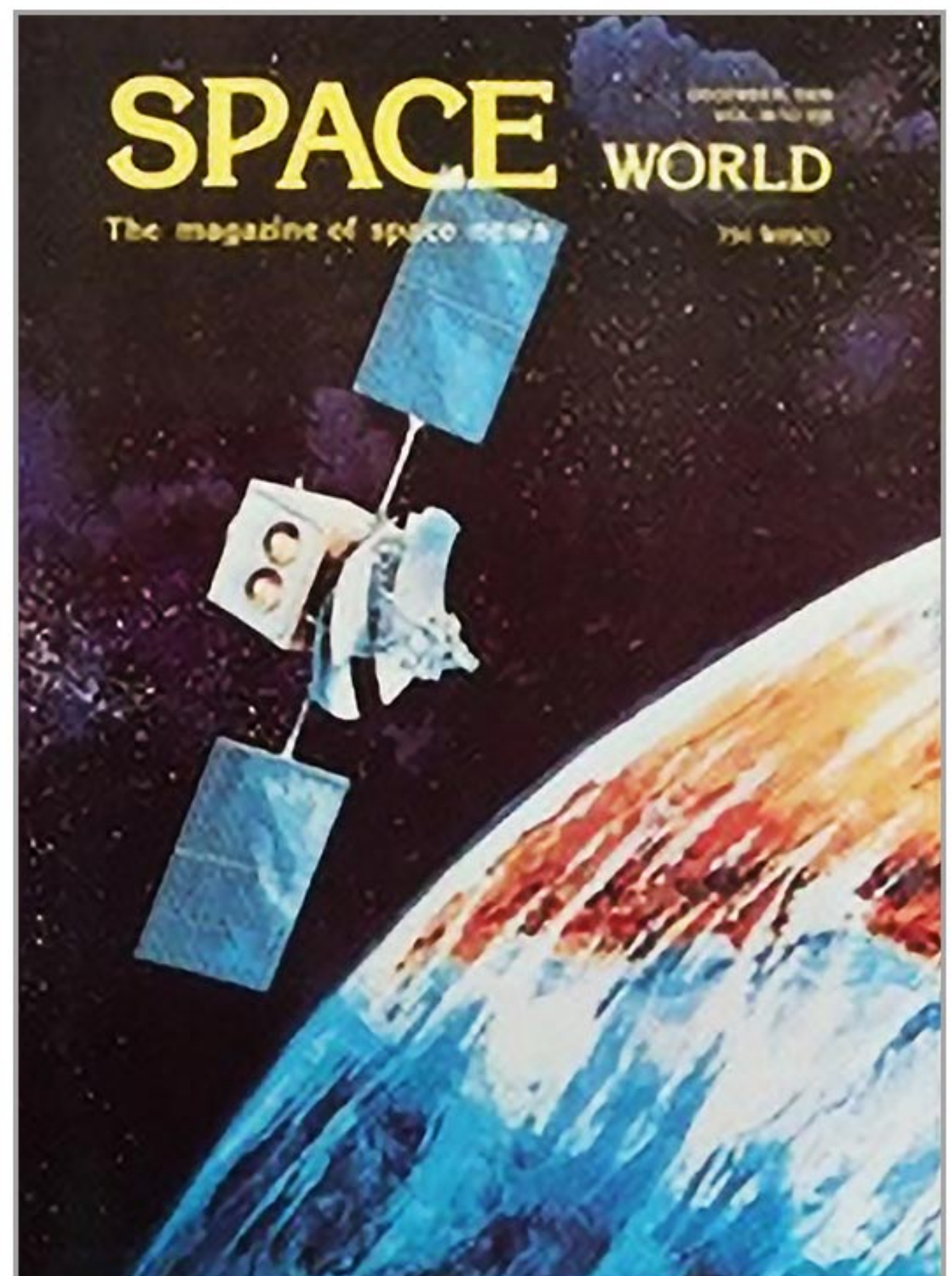
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1977

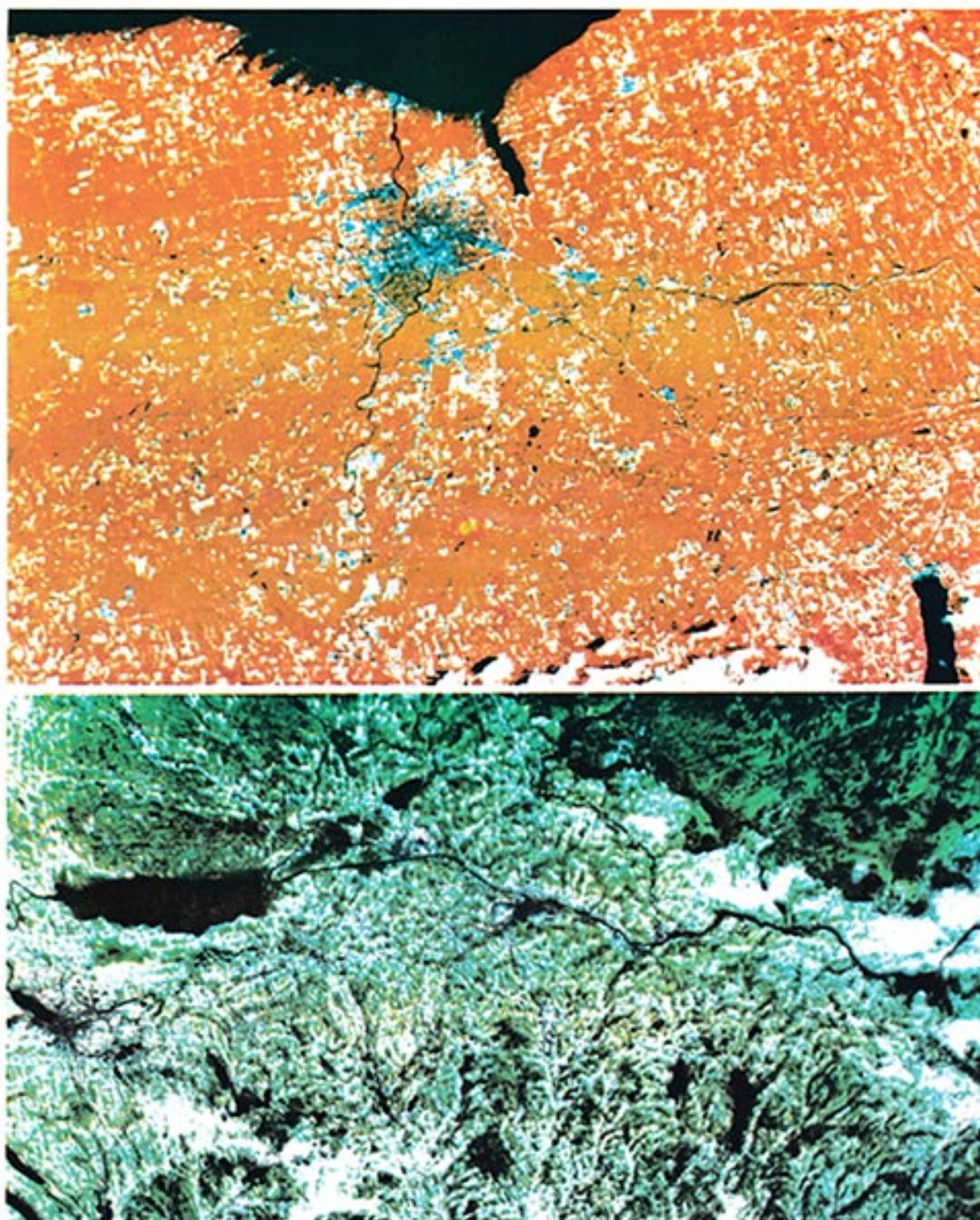


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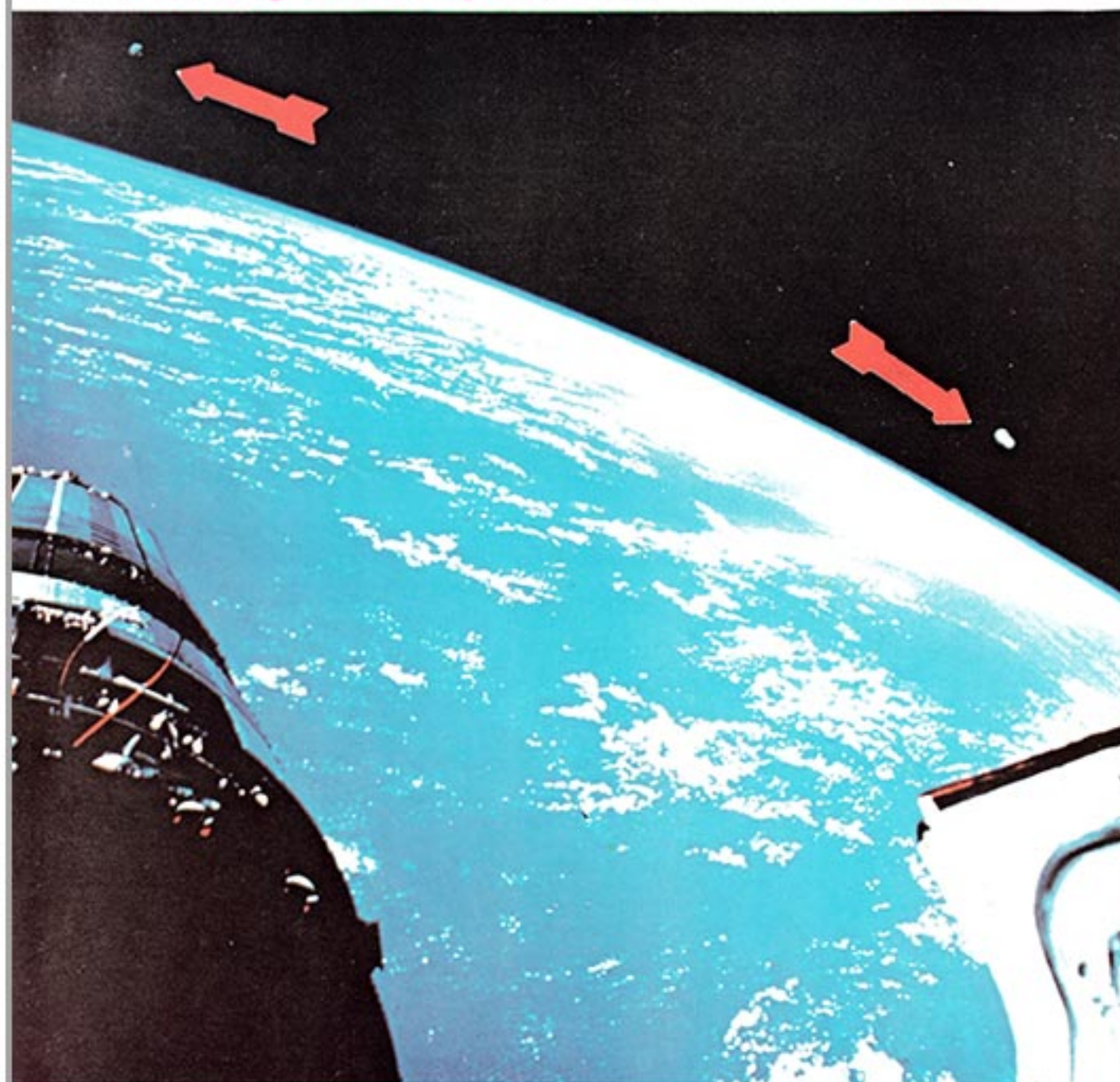


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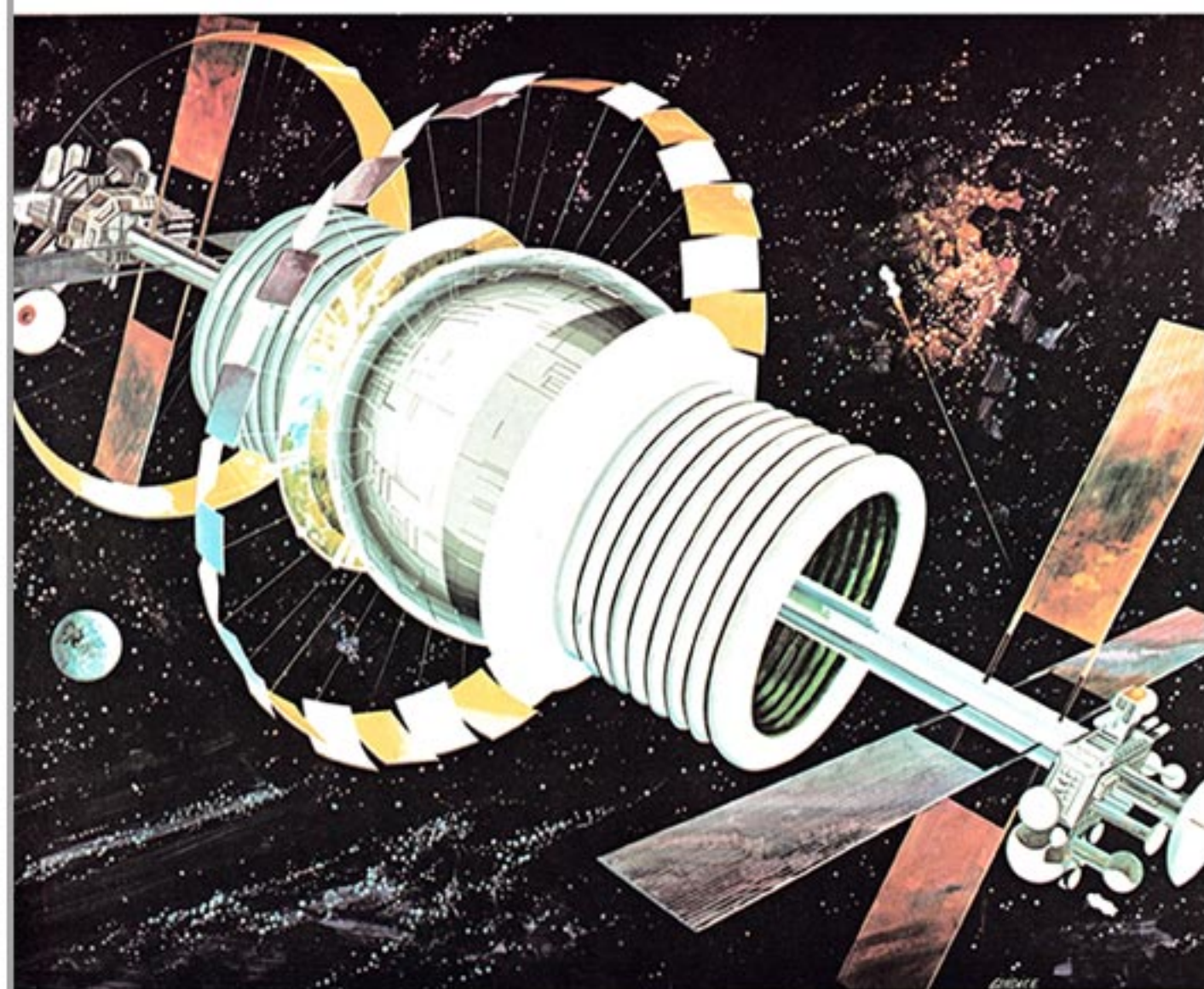
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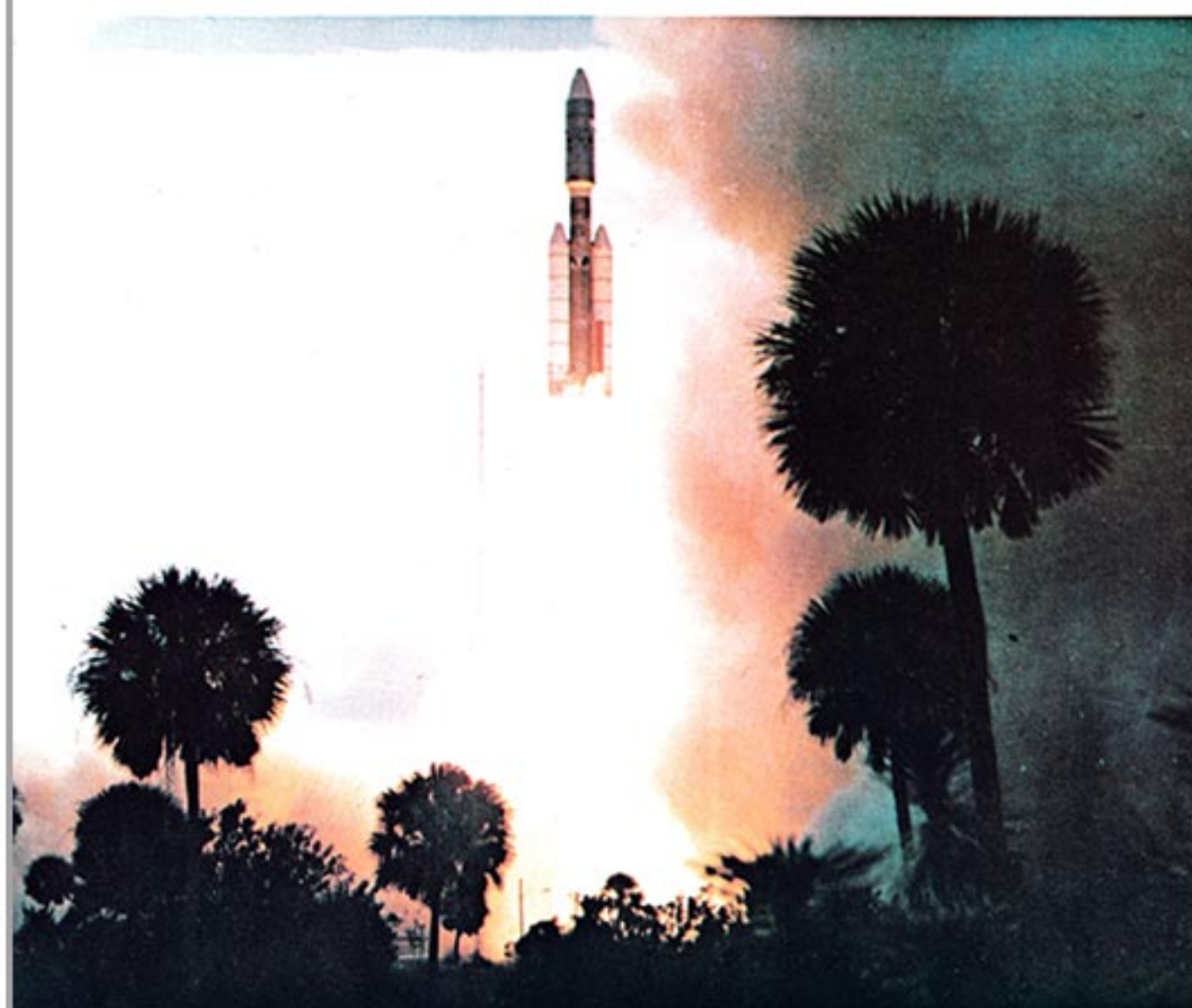
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**VIKING TO MARS**



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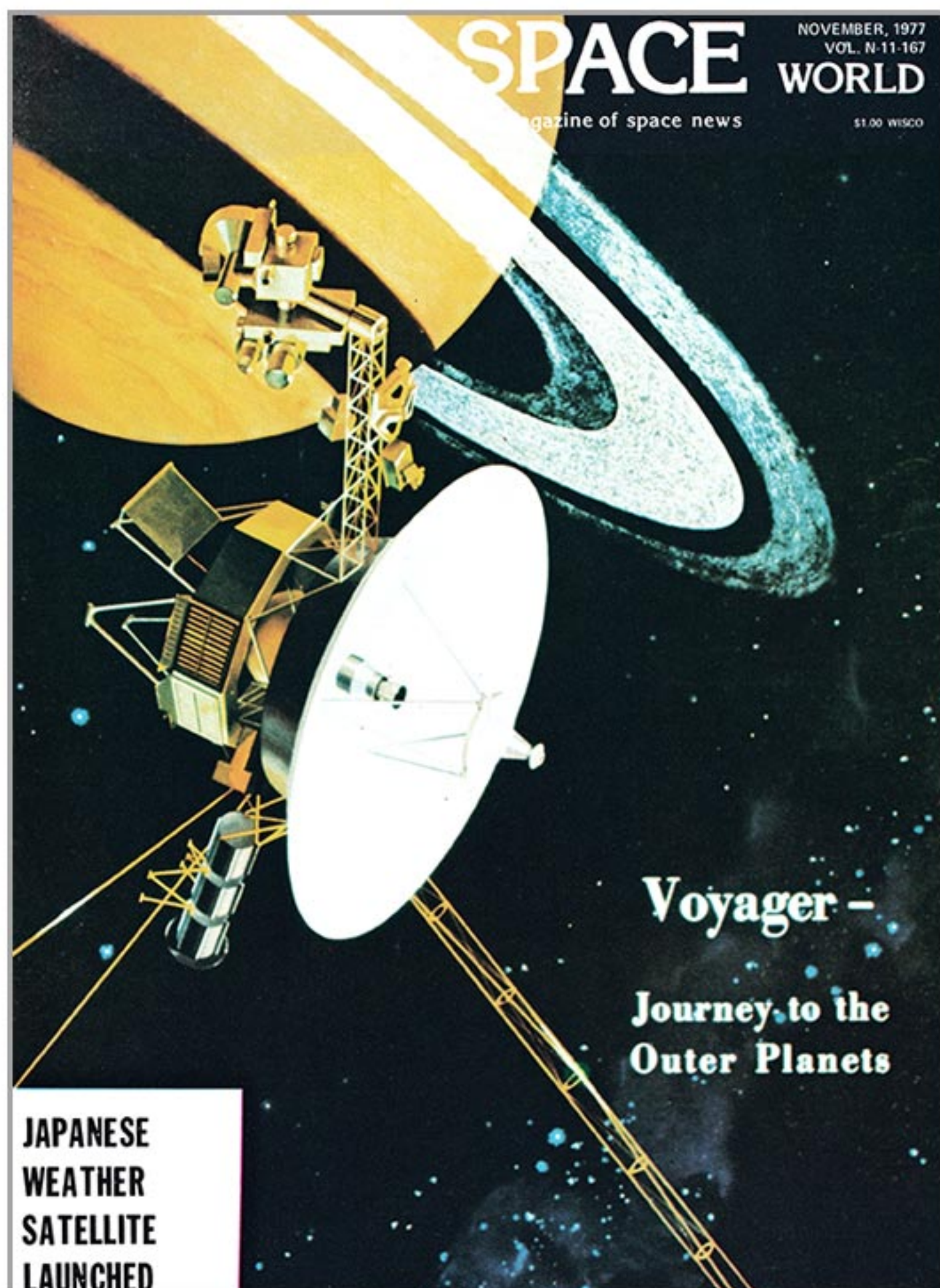
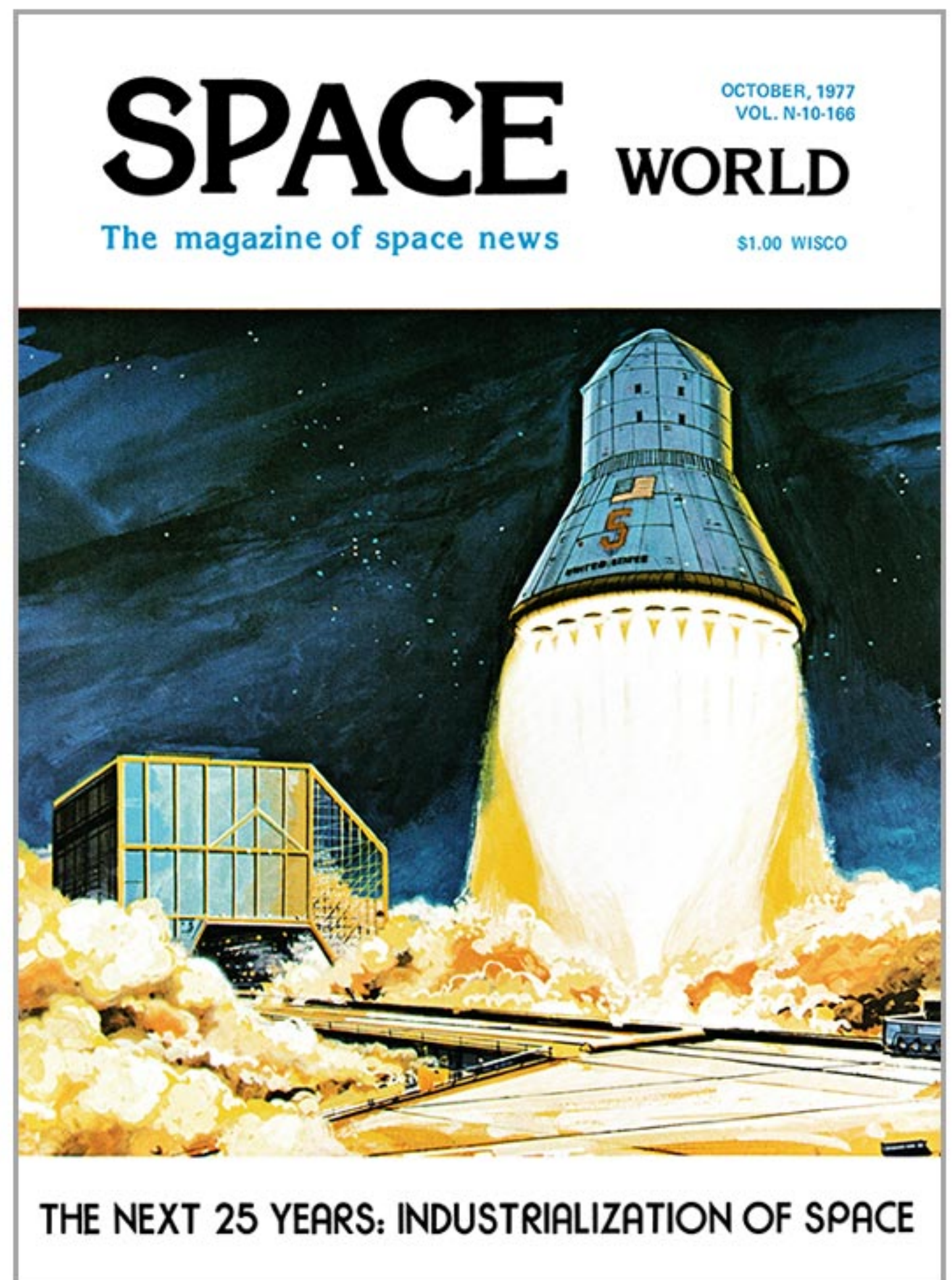
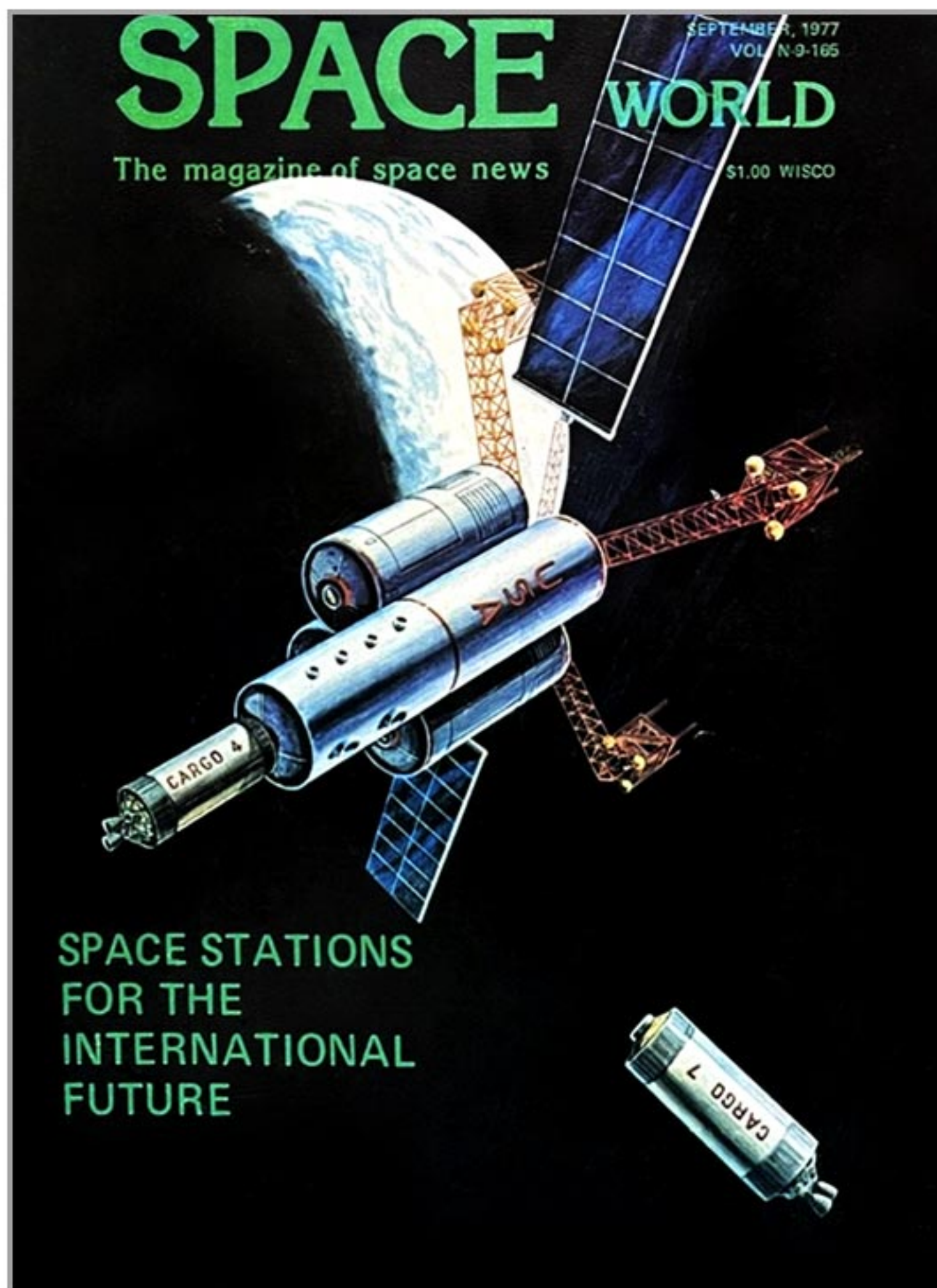
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SPACELAB

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1978



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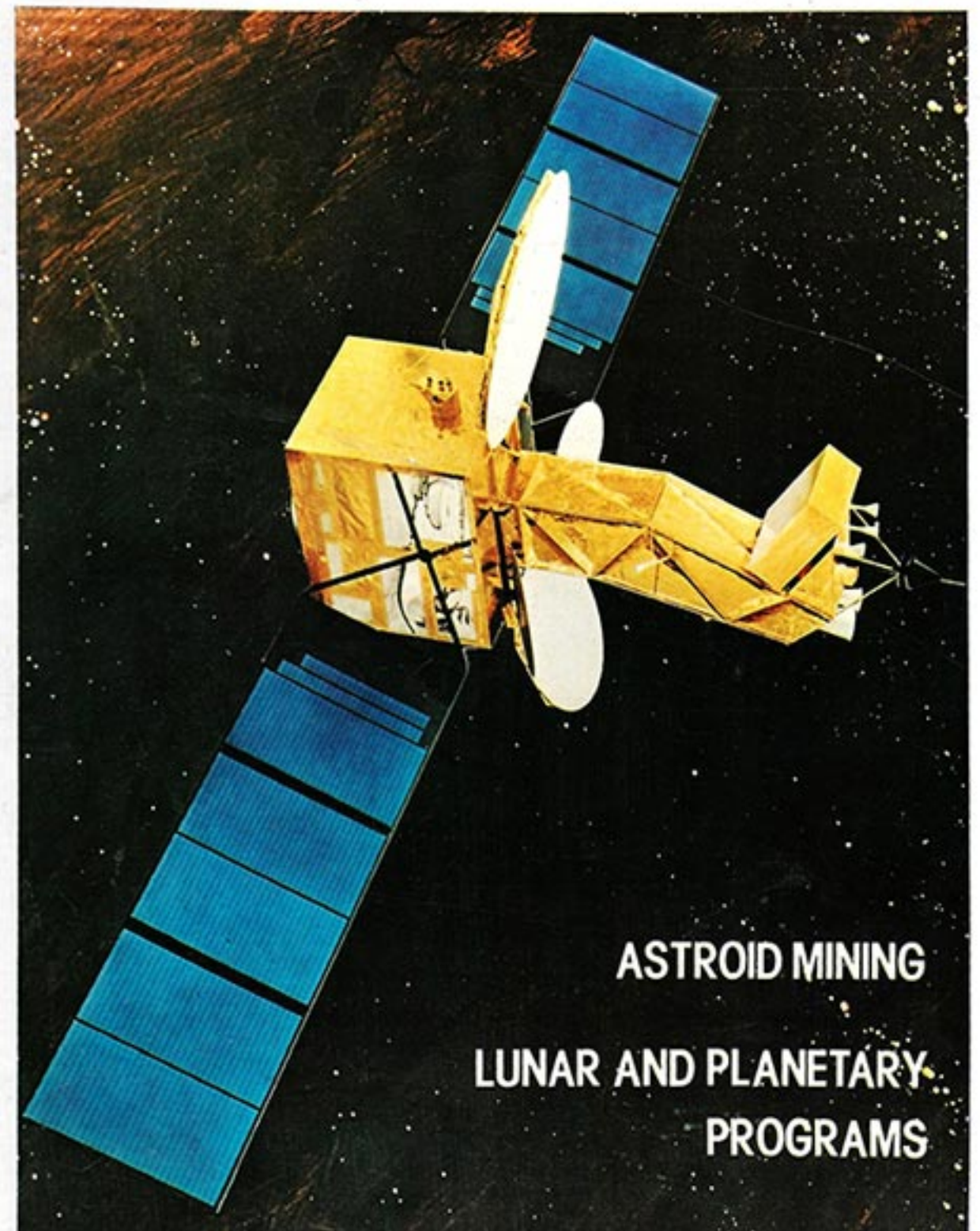


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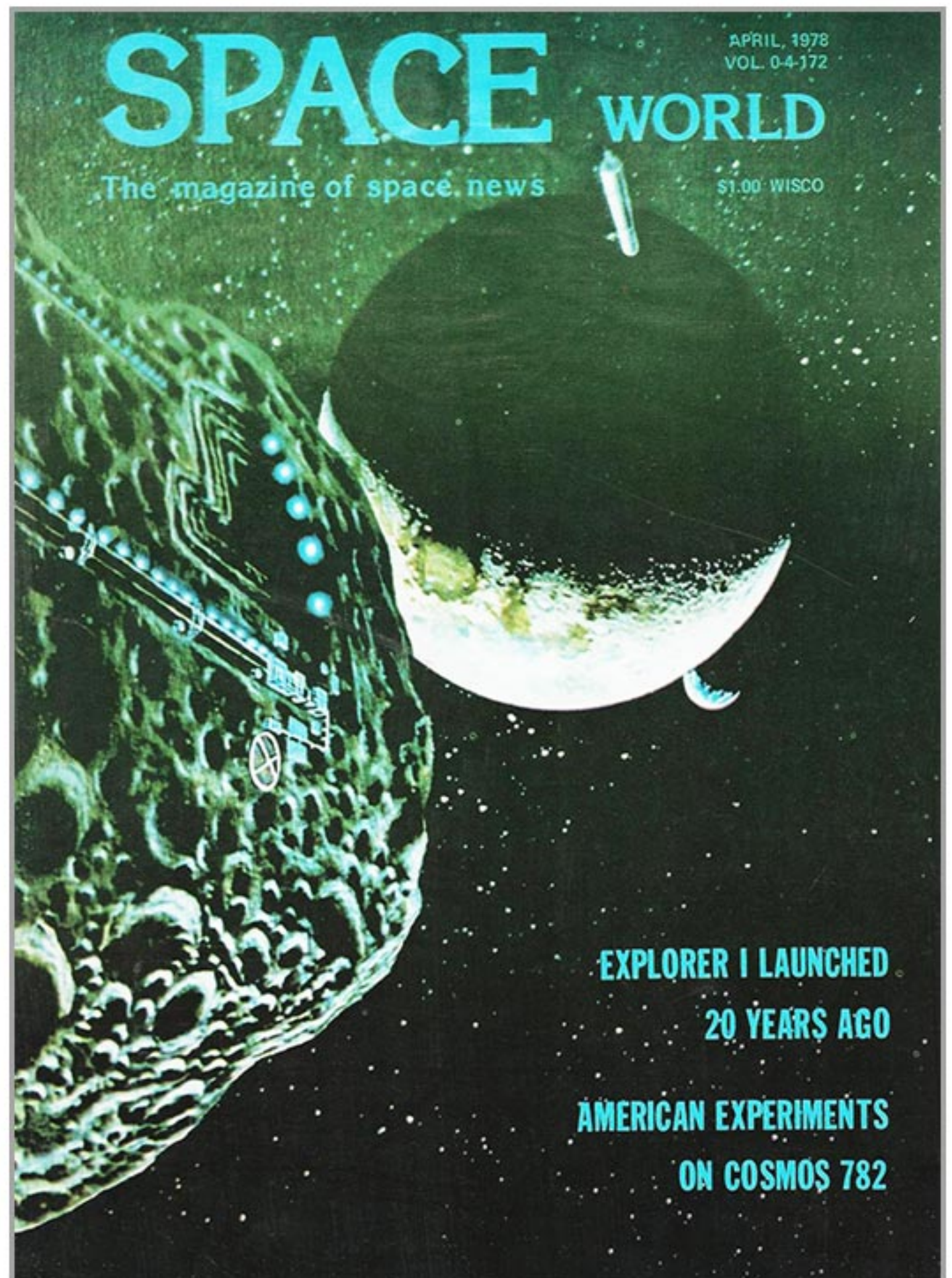
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REOPENING SKYLAB

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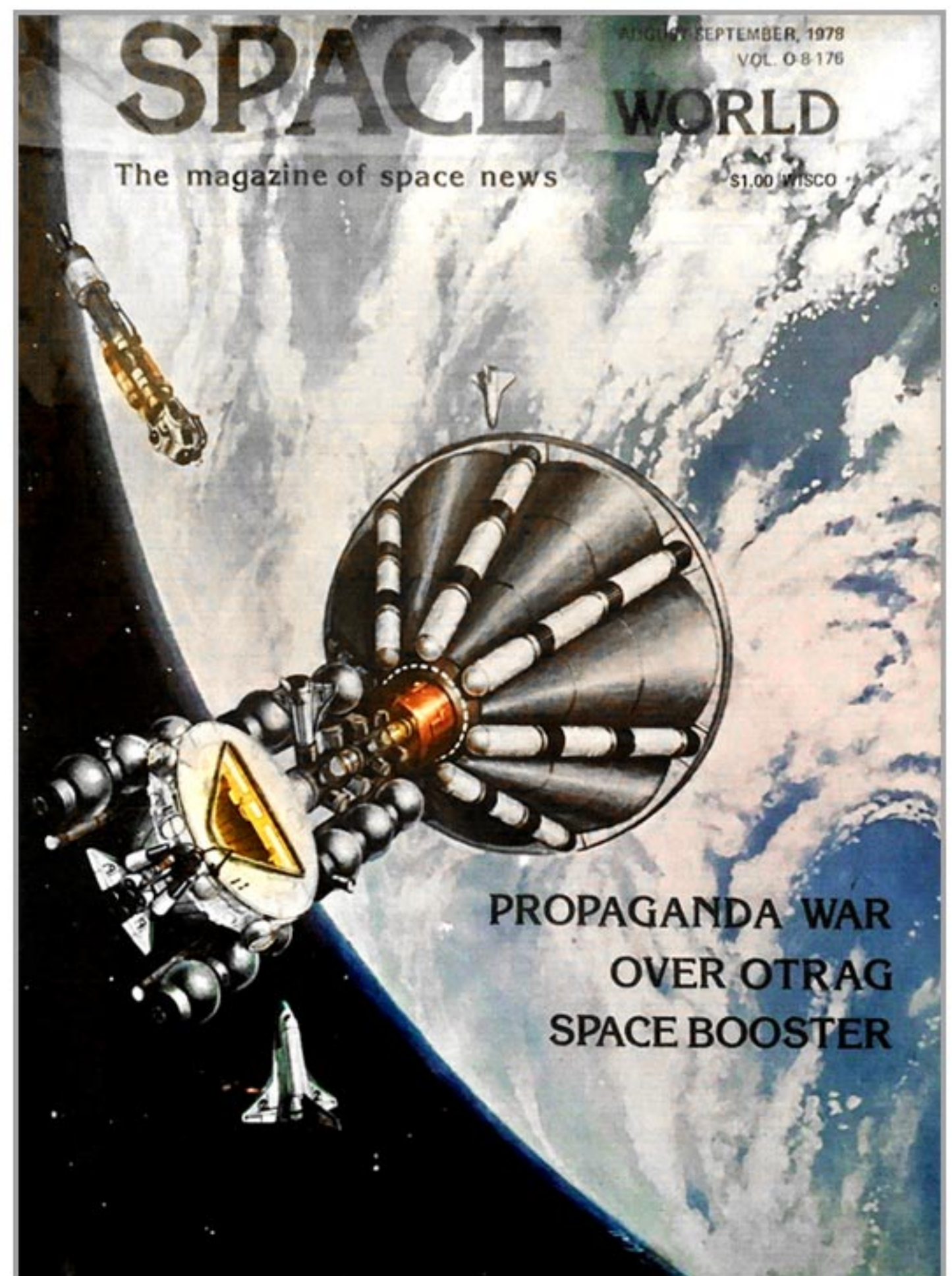
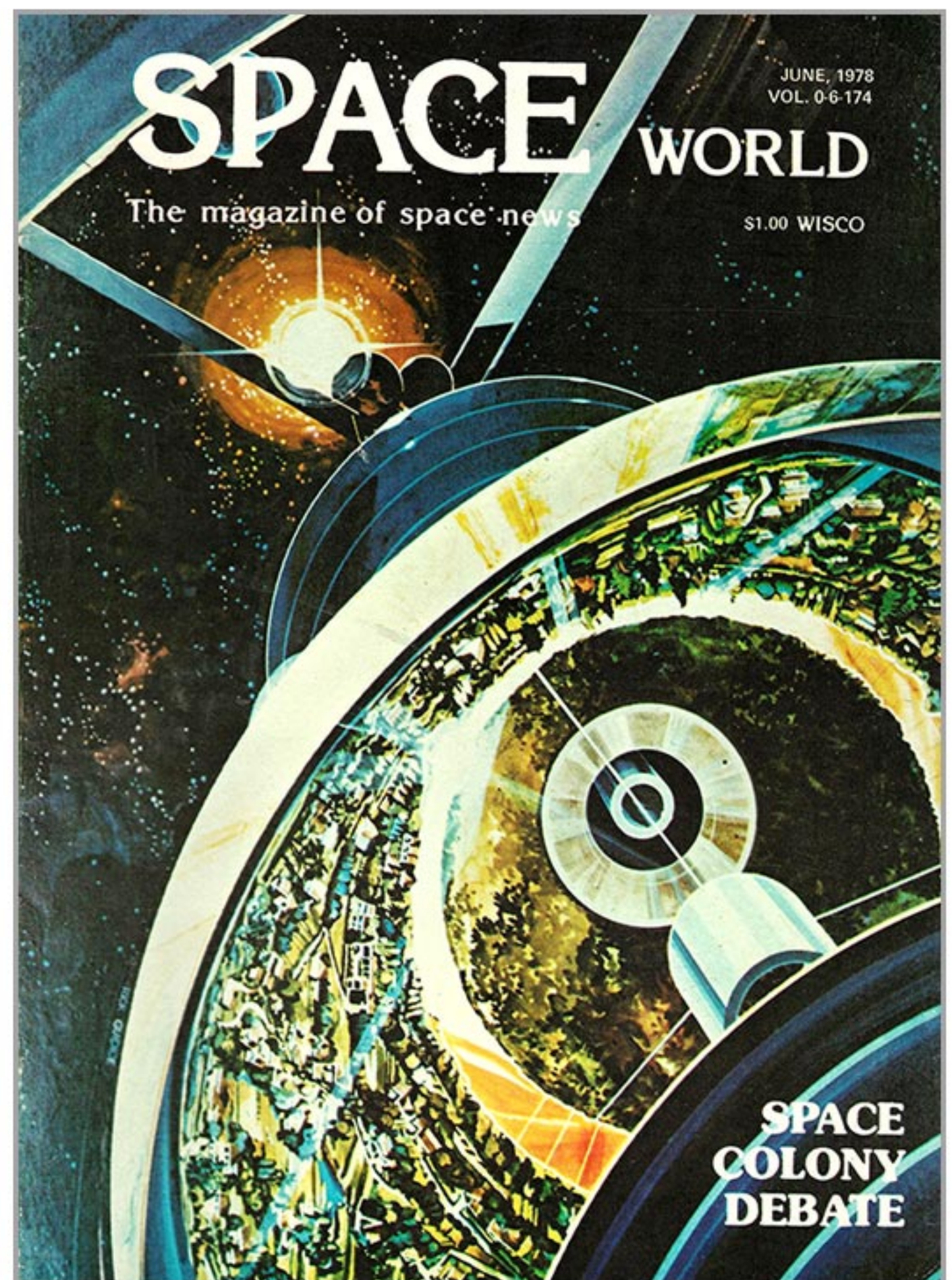
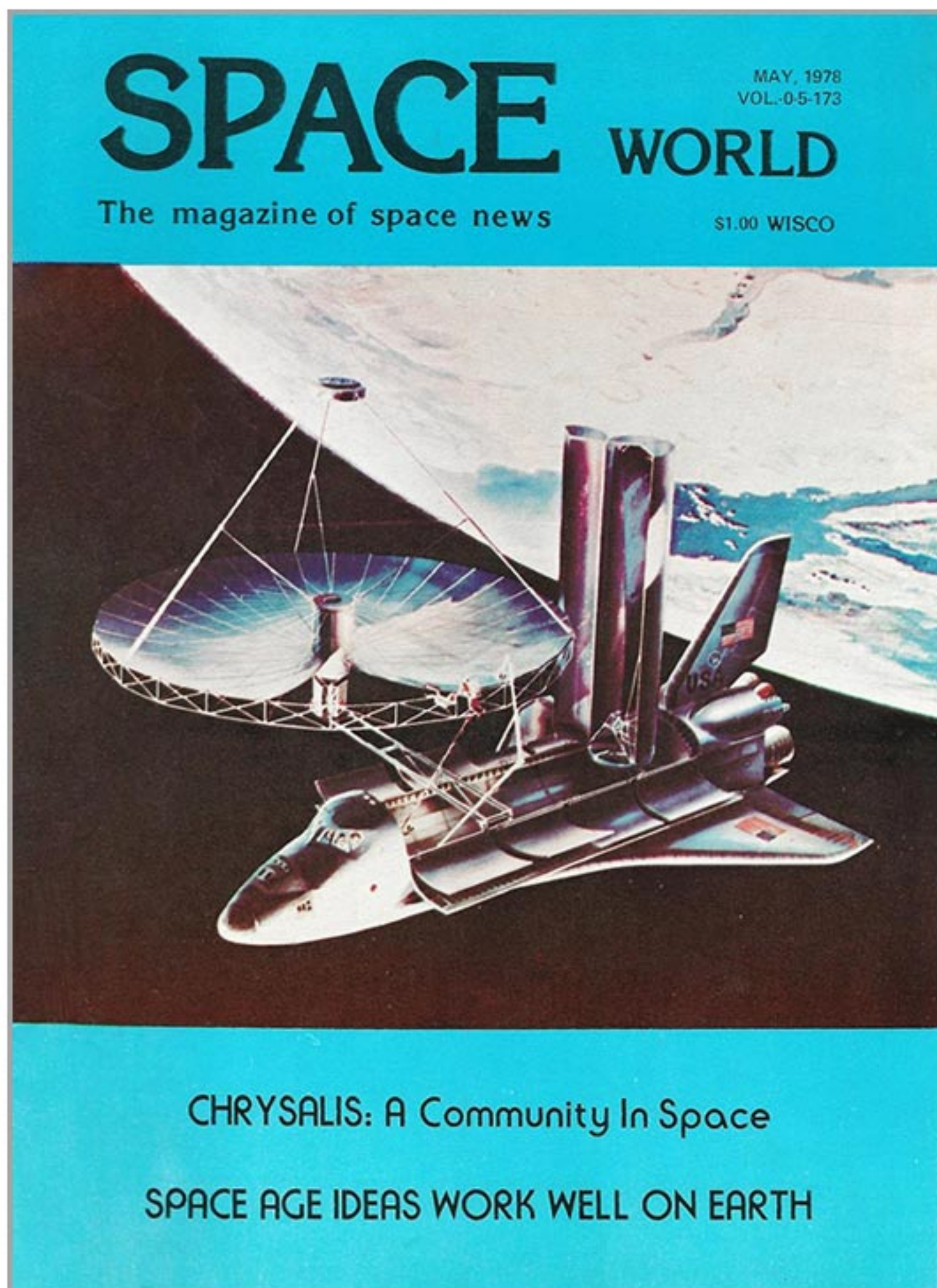
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EXPLORER 1 LAUNCHED  
20 YEARS AGO

AMERICAN EXPERIMENTS  
ON COSMOS 782





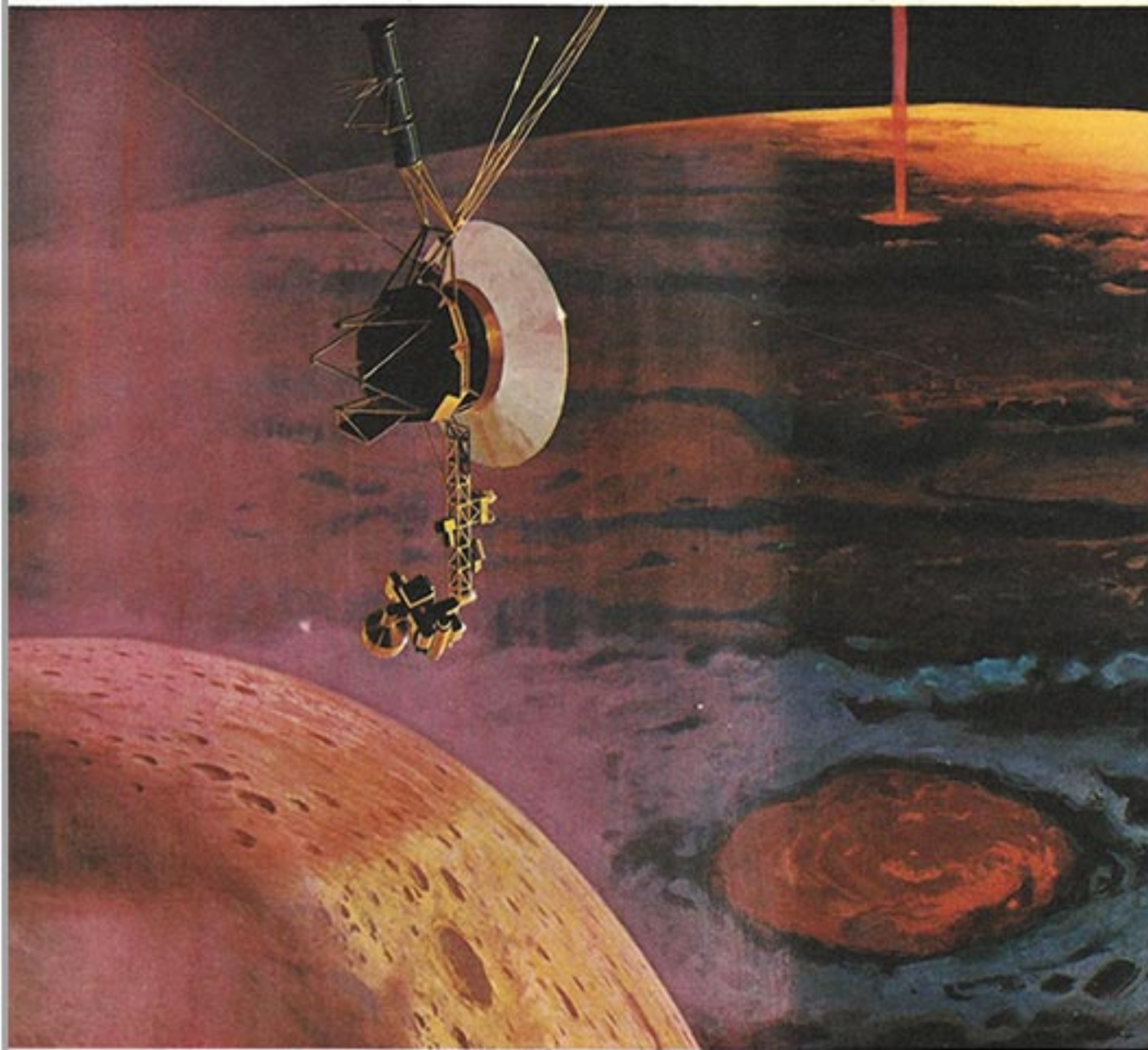


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ANCESTORS  
OF THE  
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**SPACE** WORLD

1979



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SUSTAINING LIFE IN A SPACE COLONY

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SPACE STATIONS

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NEW ERA

WOMEN  
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MINING  
OUTER  
SPACE



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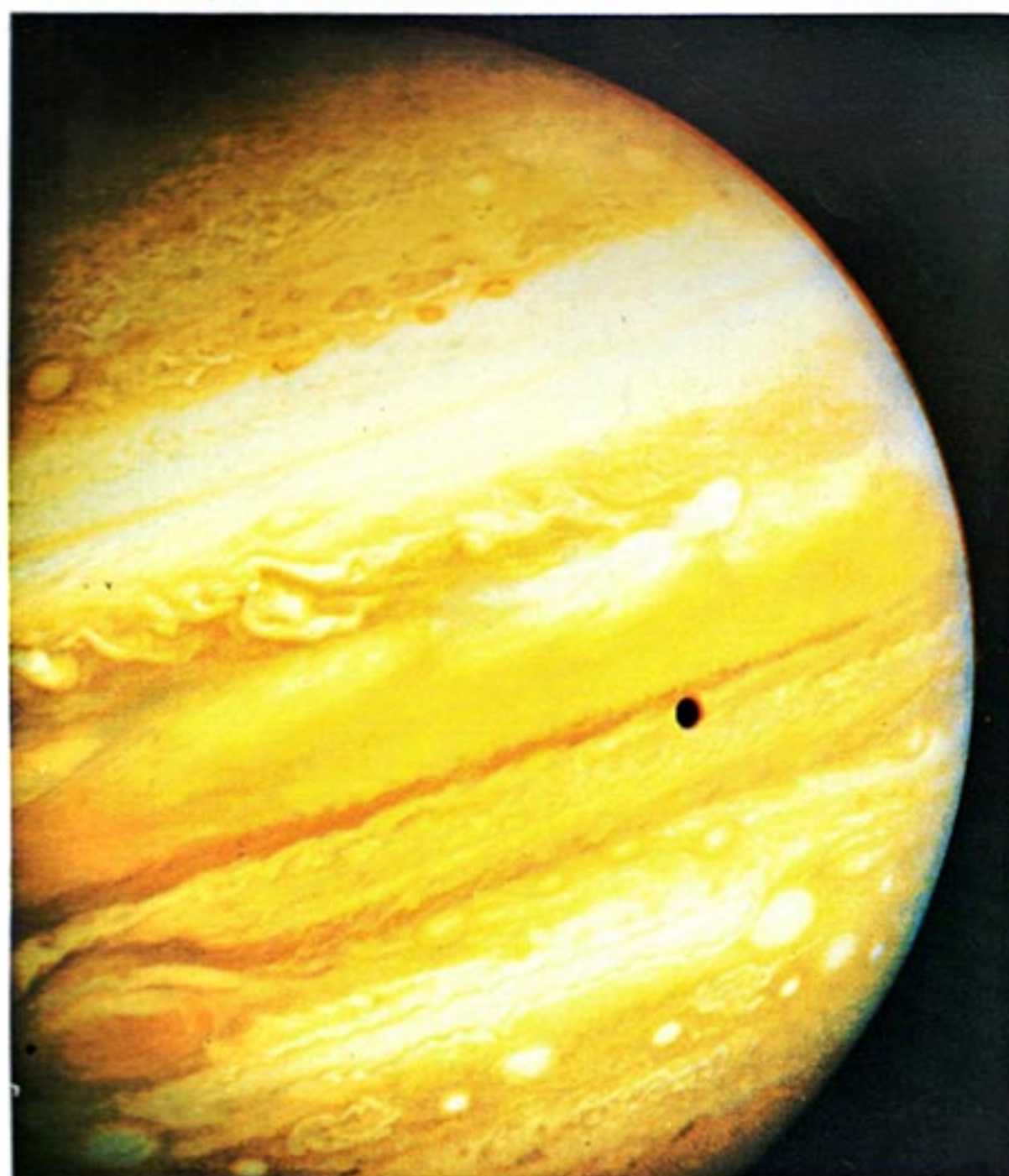
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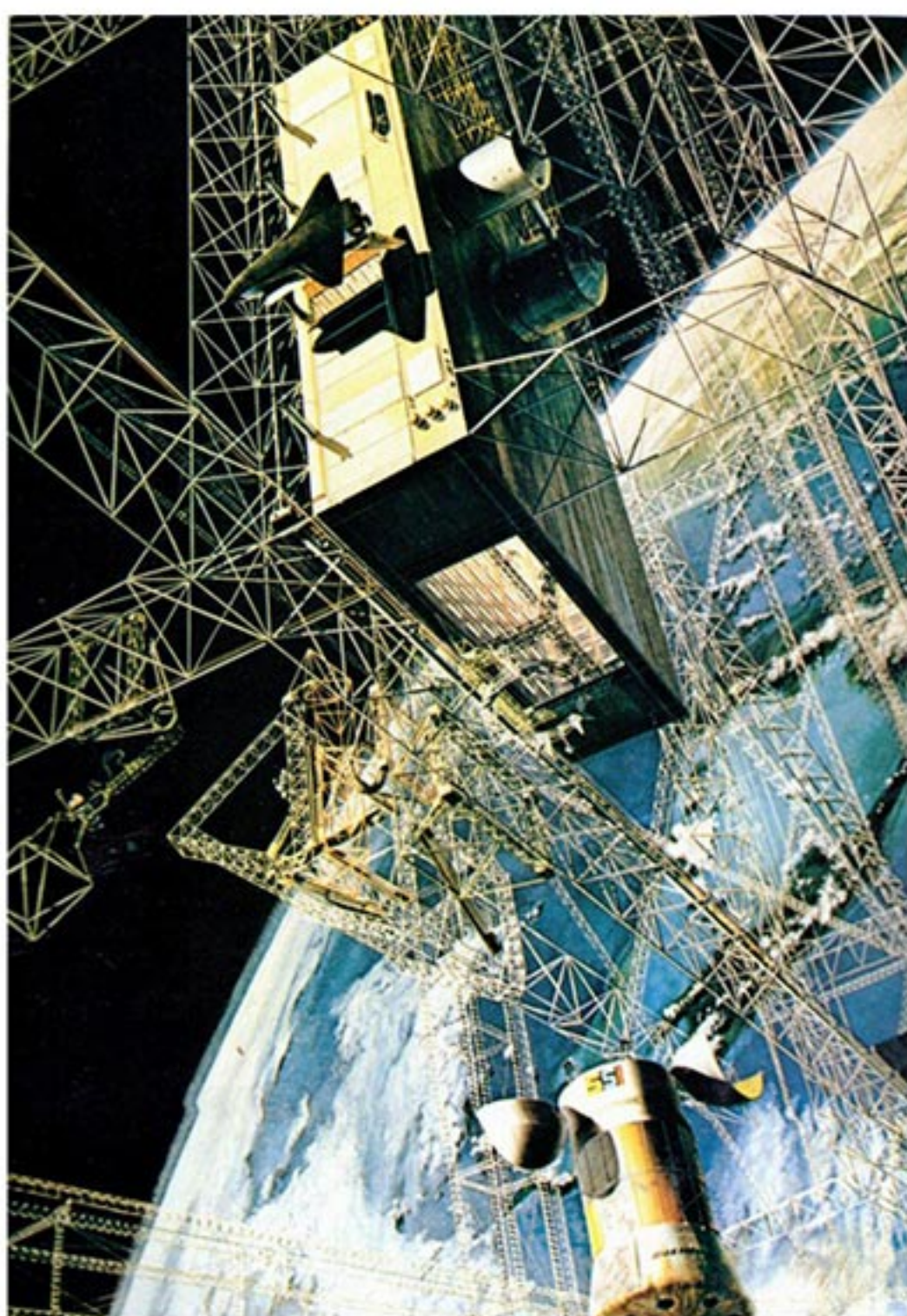
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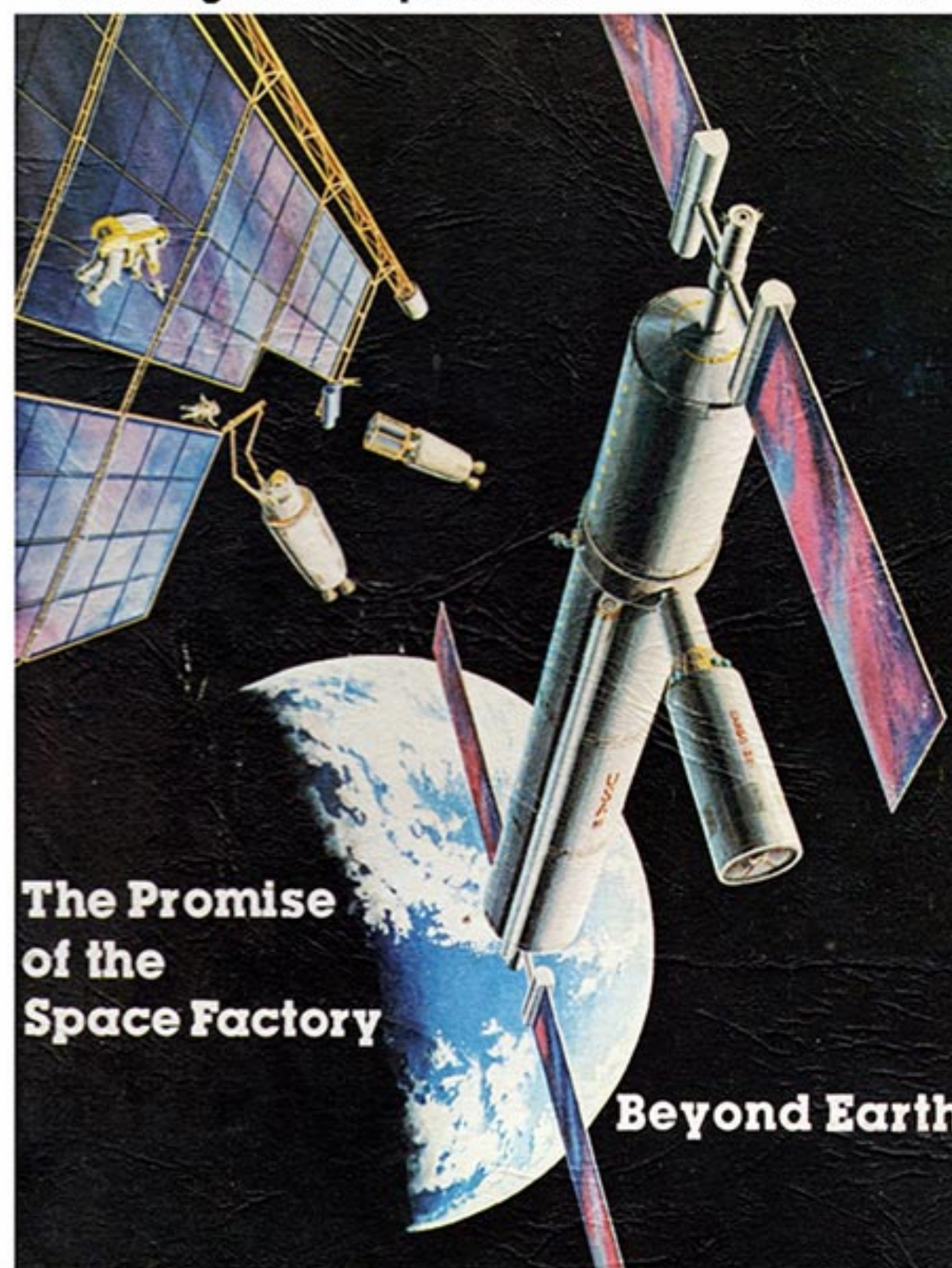


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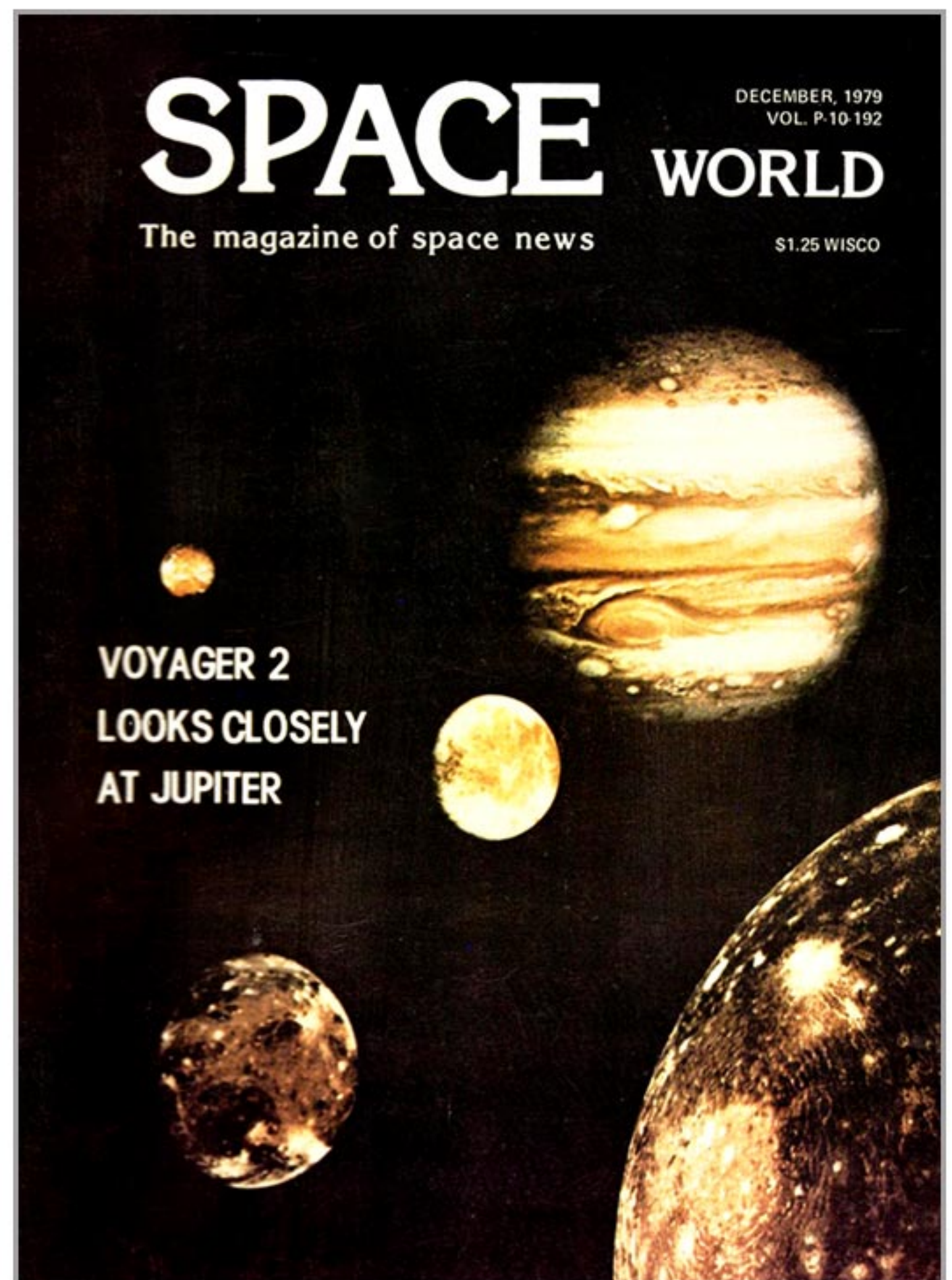
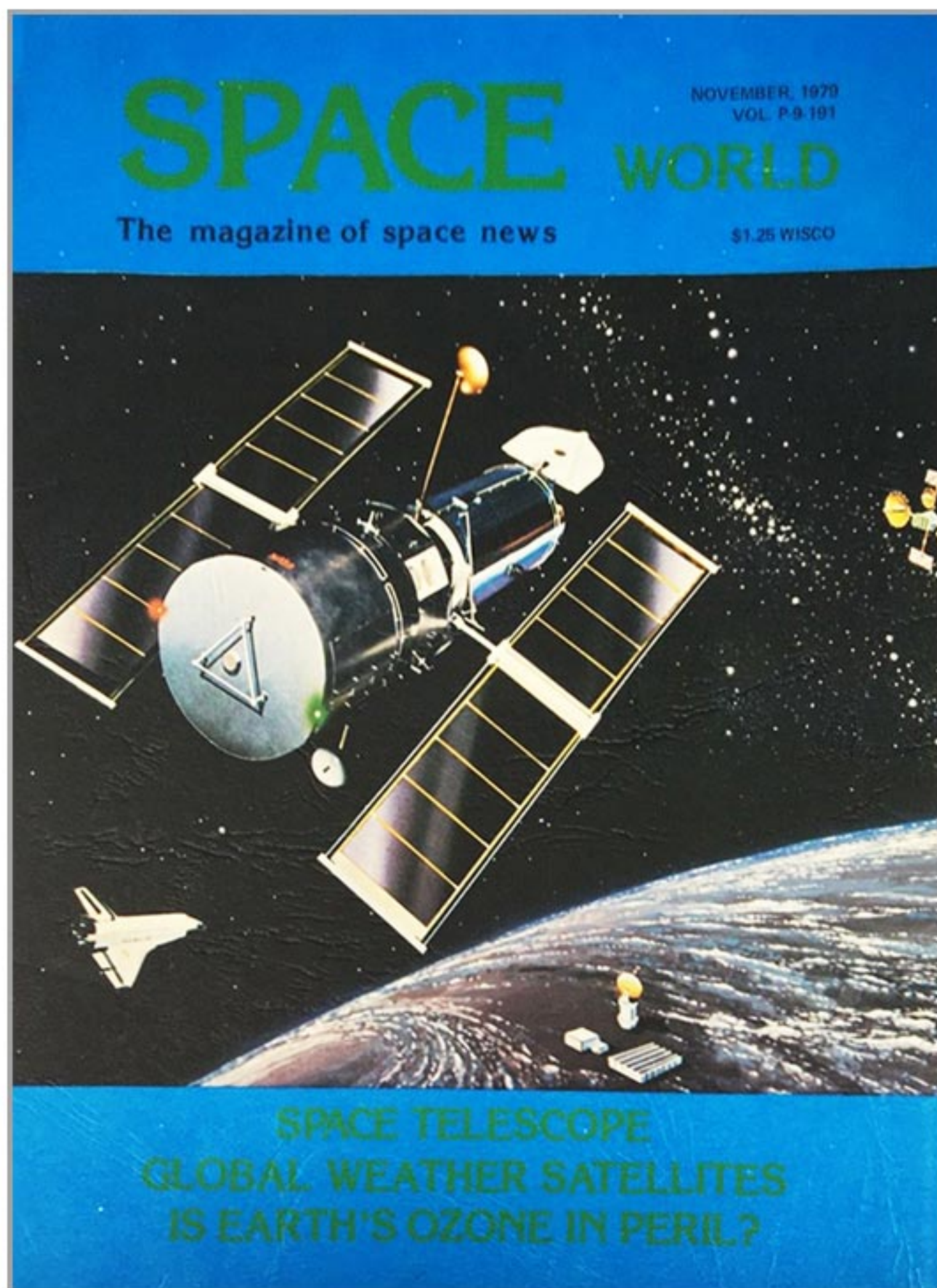
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1980

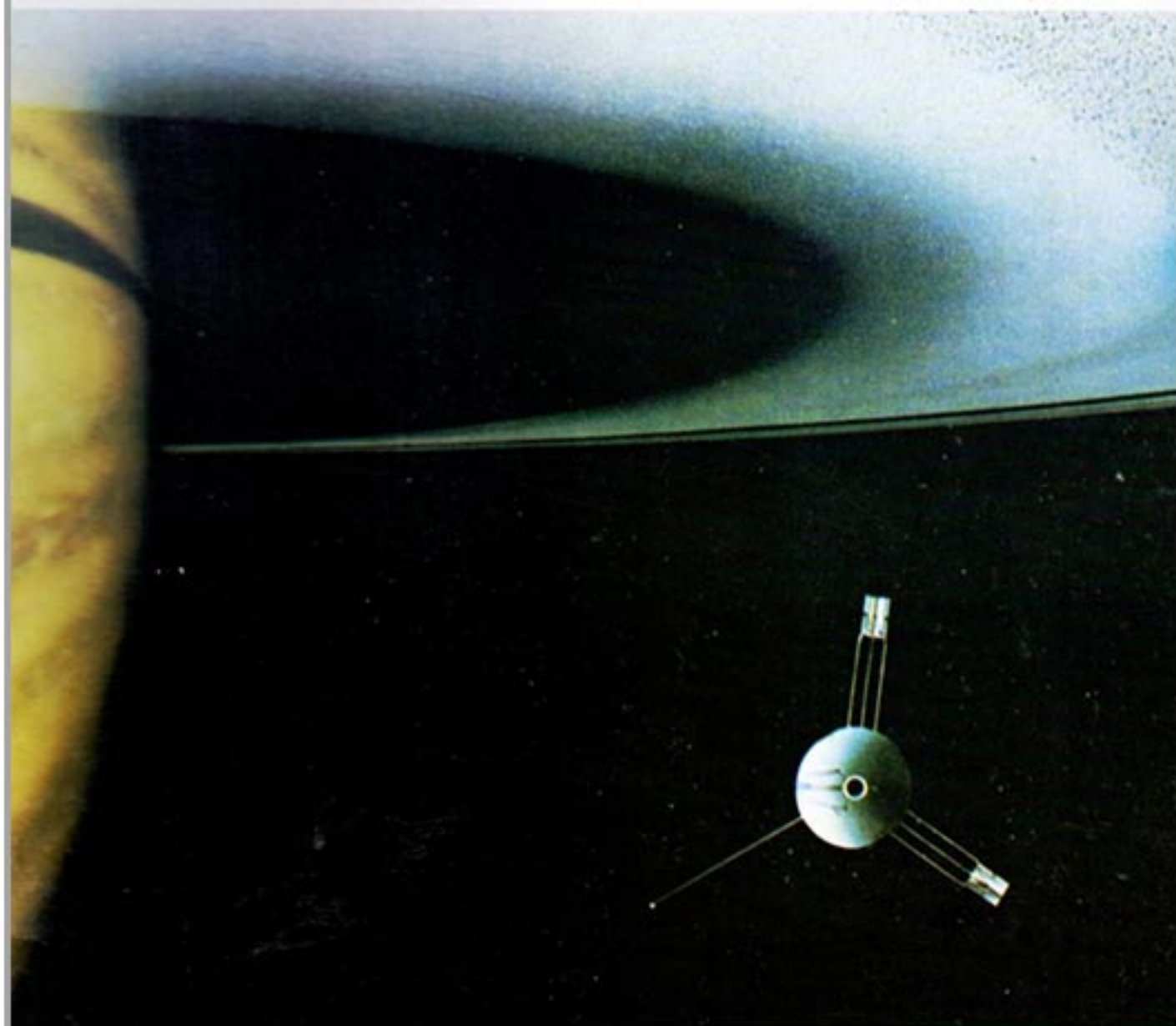


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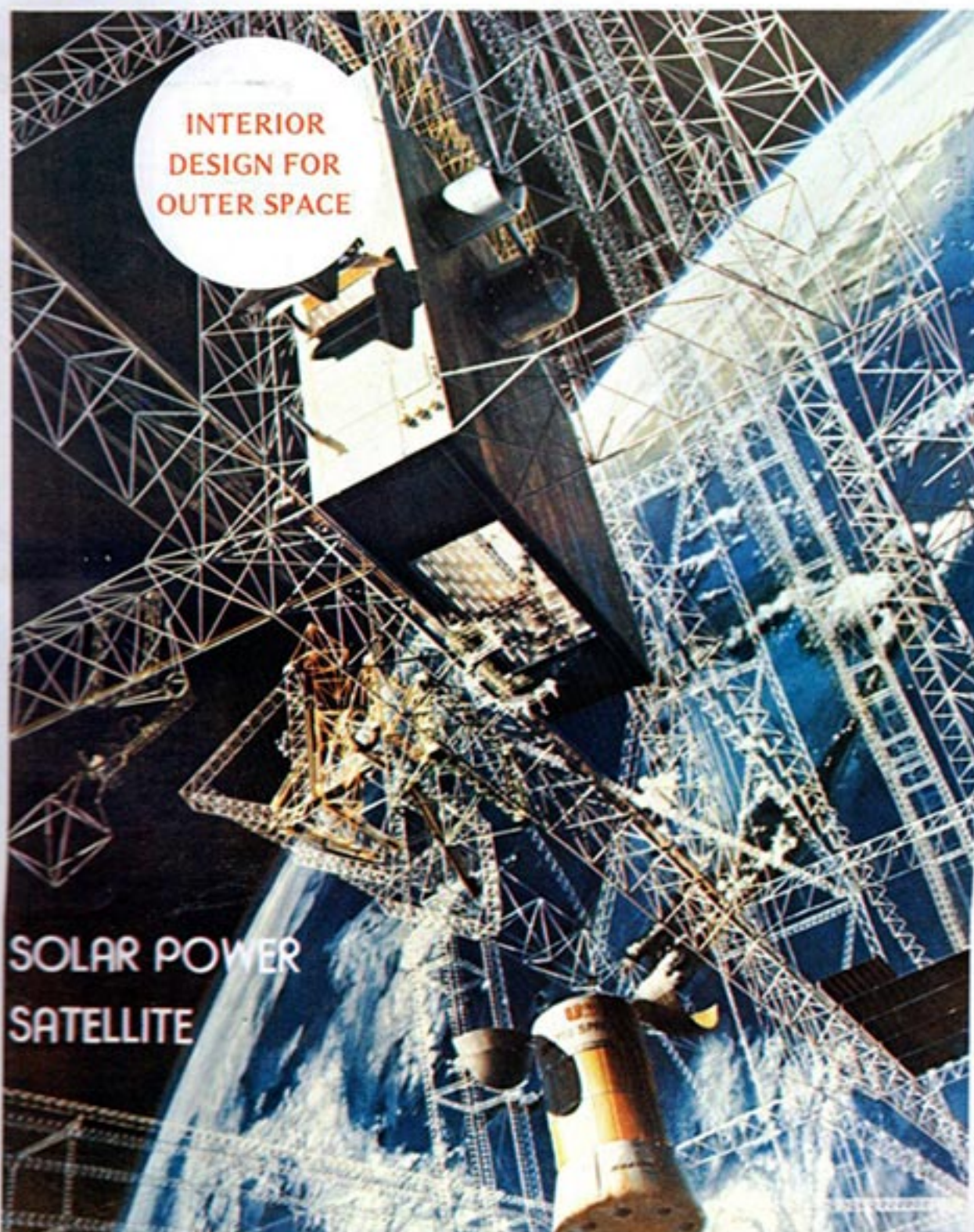
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HARDHATS IN SPACE

ALABAMA SPACE &  
ROCKET CENTER

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ORBITING OBSERVATORIES  
scan the unseen universe

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1979 SALYUT MISSION

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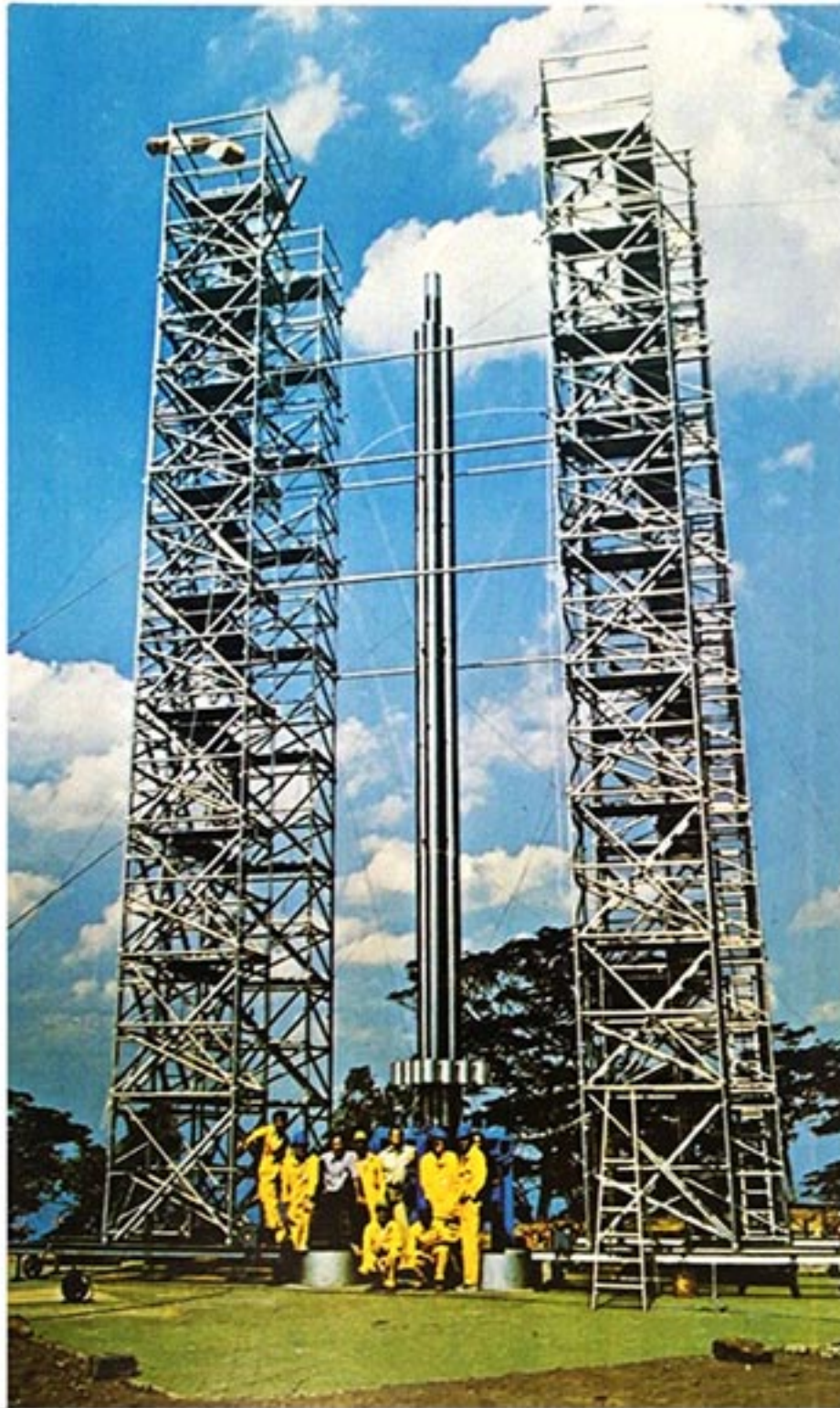
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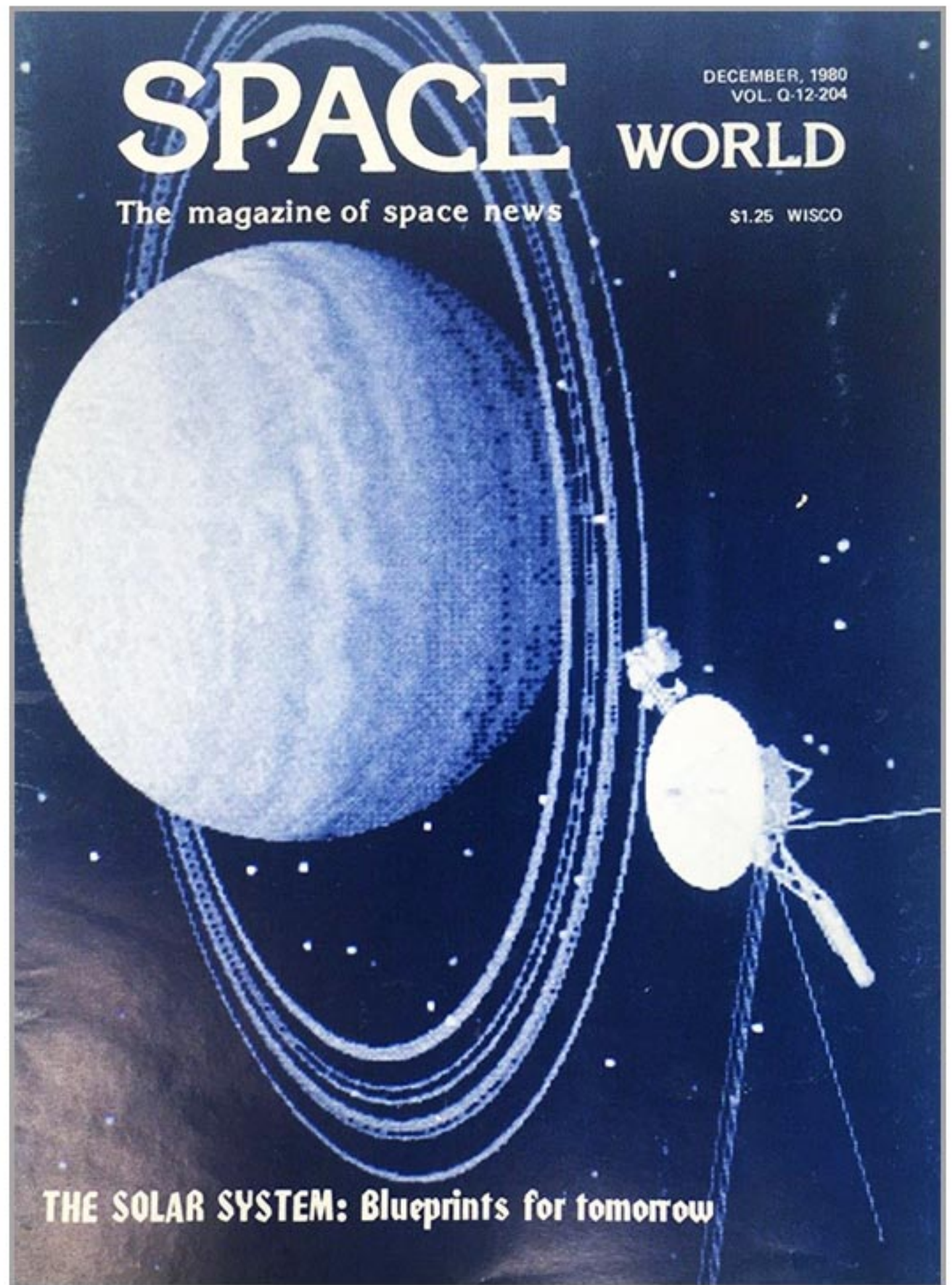


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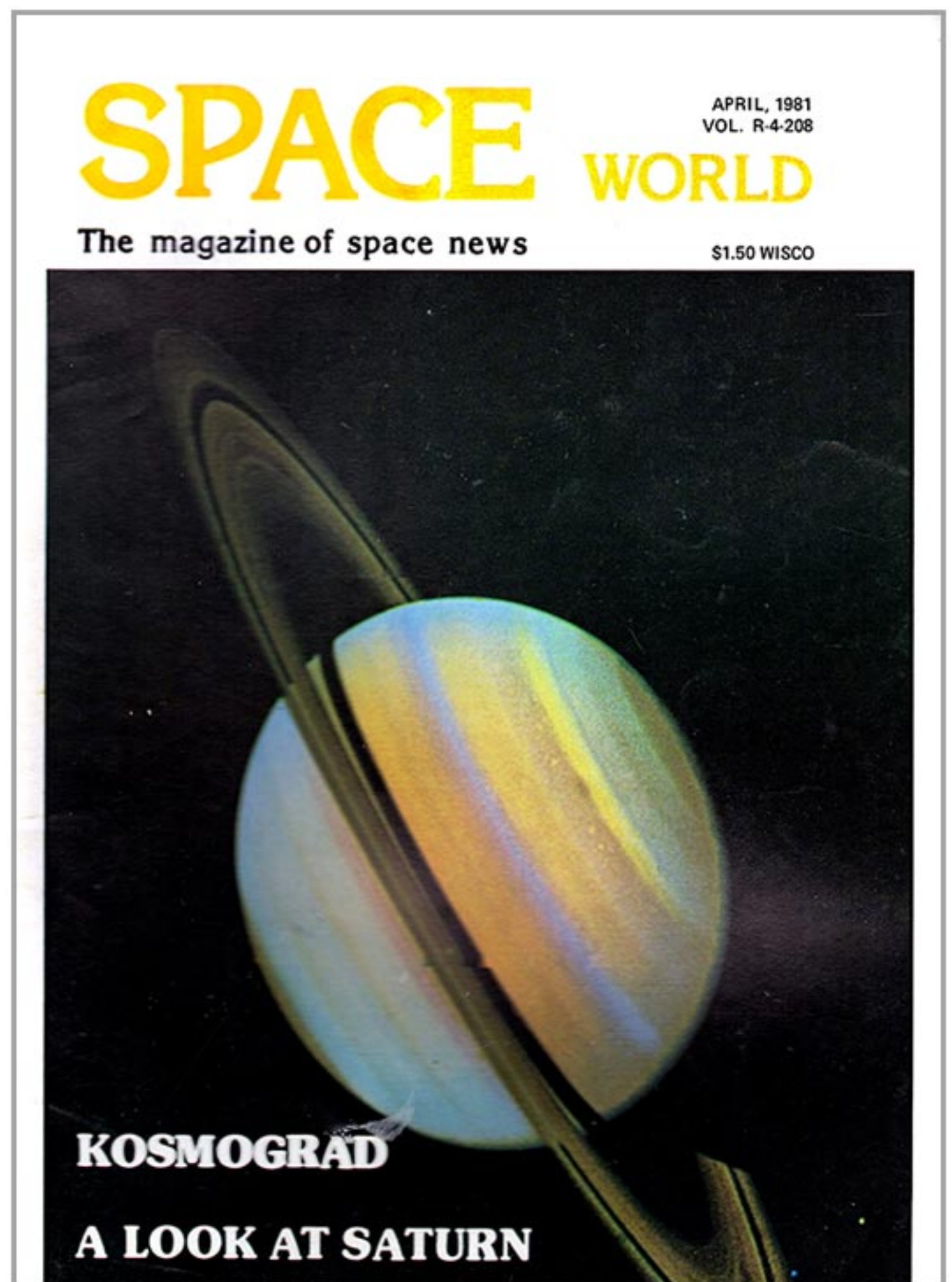
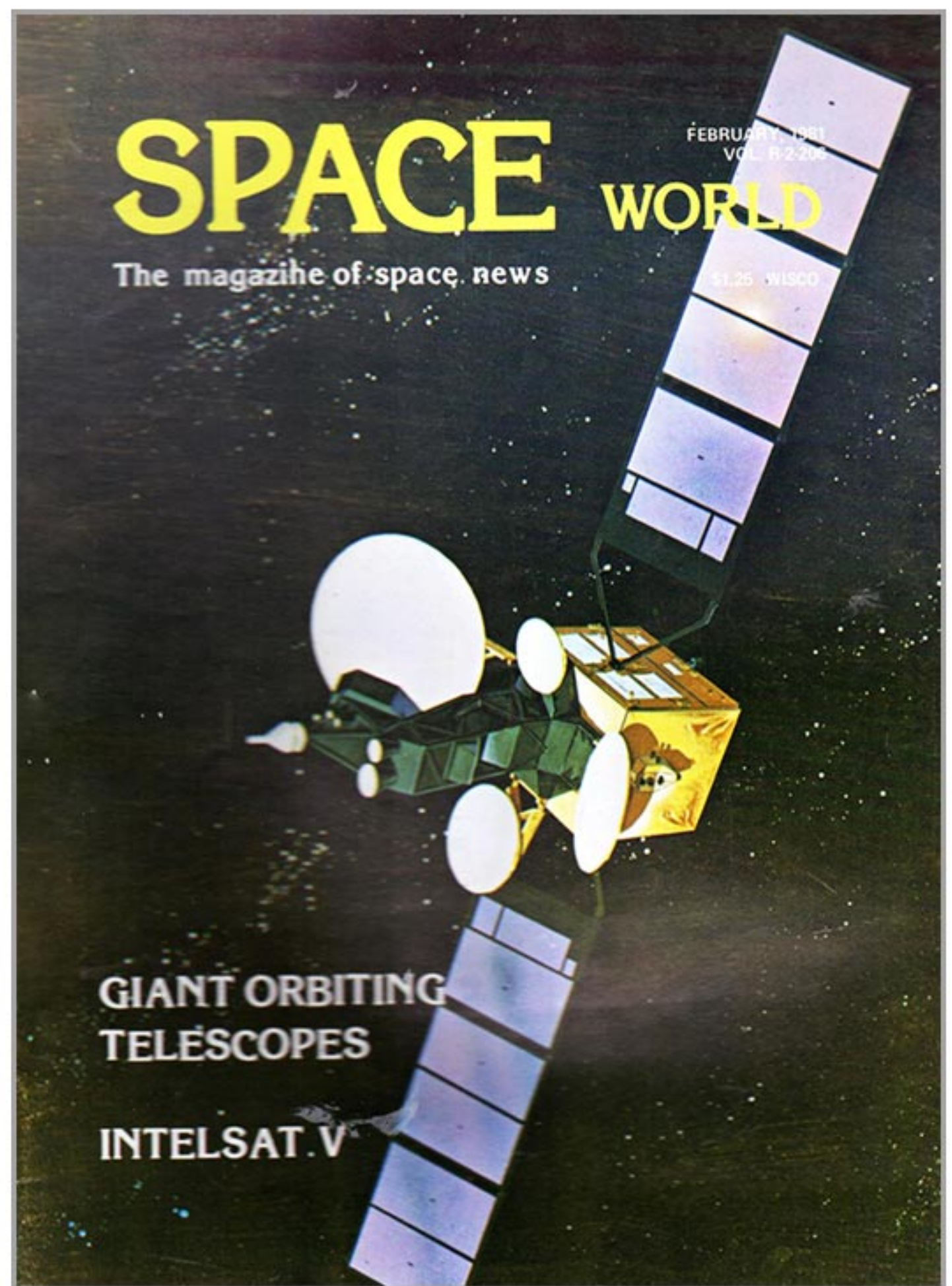
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1981







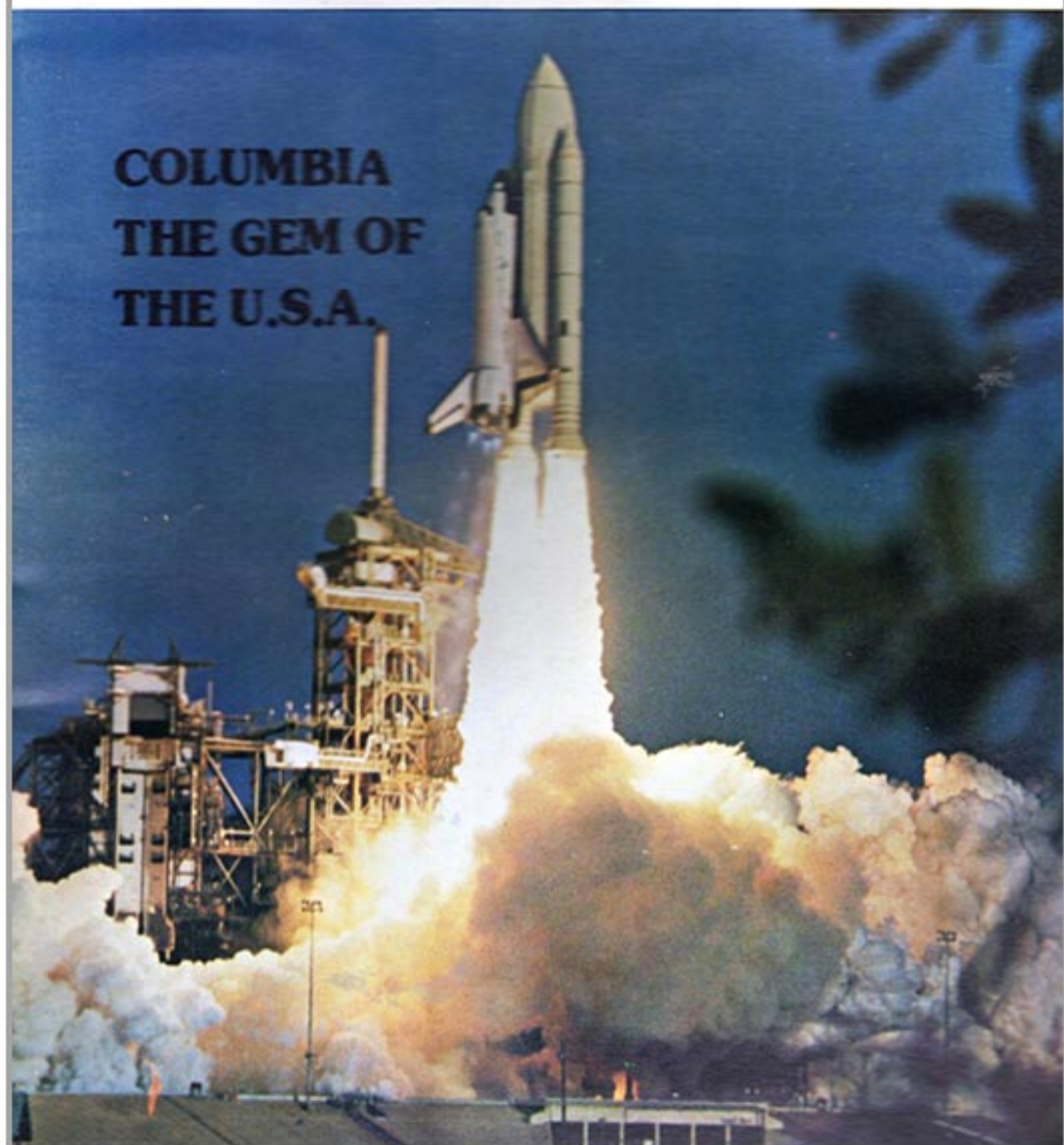
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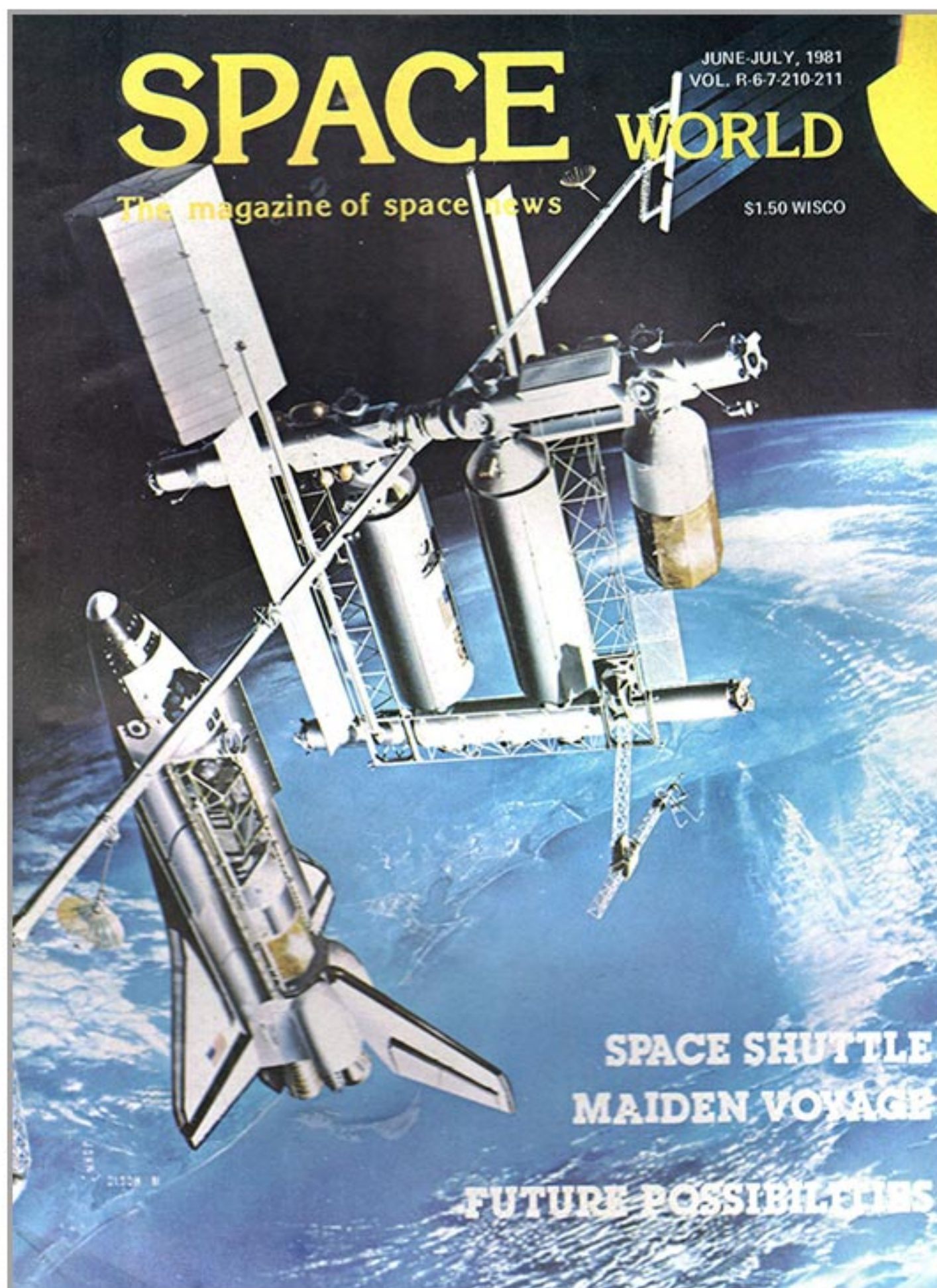
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SPACE SHUTTLE  
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FUTURE POSSIBILITIES



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WHO  
OWNS  
OUTER  
SPACE?

Voyager 2

Space  
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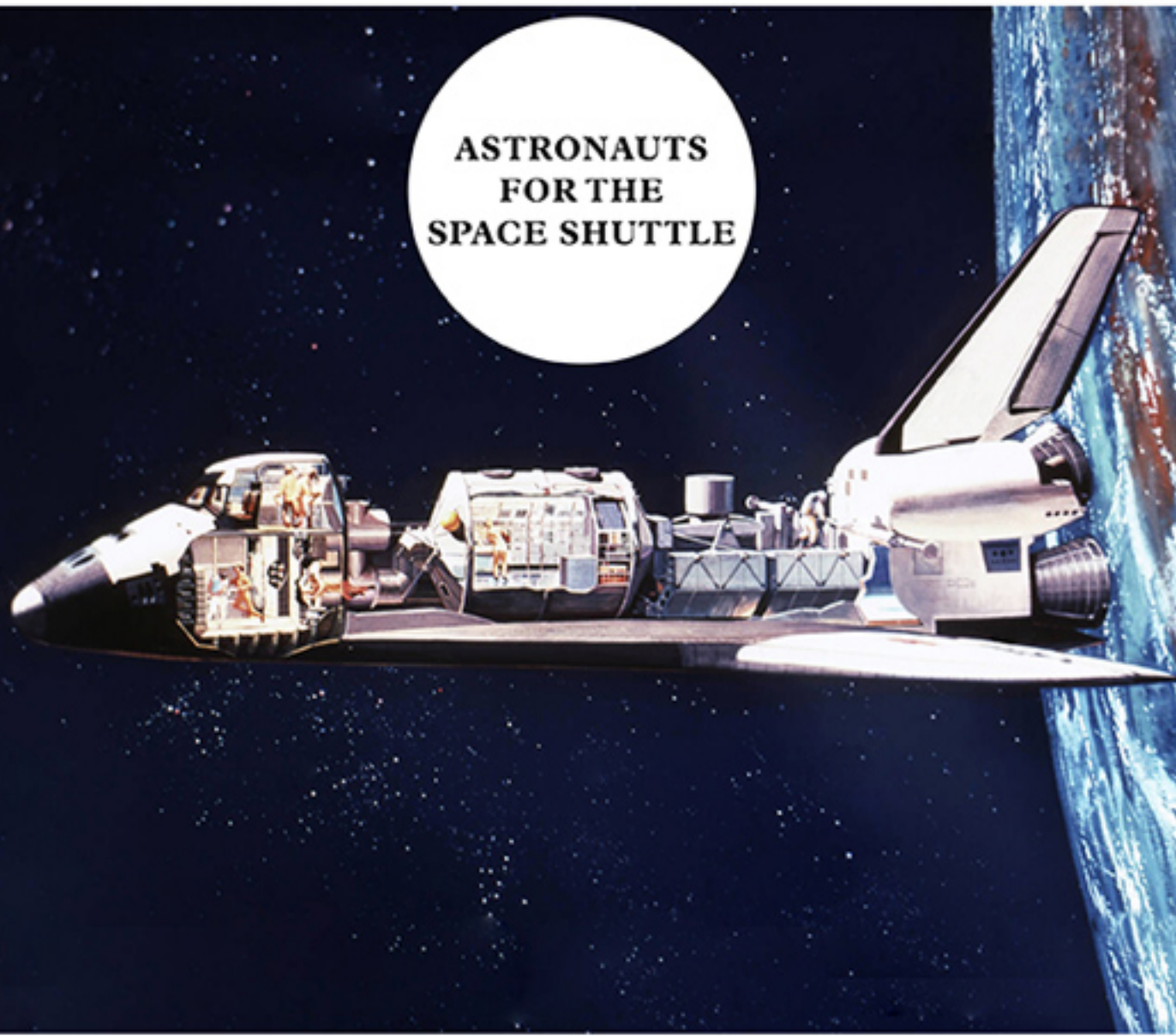
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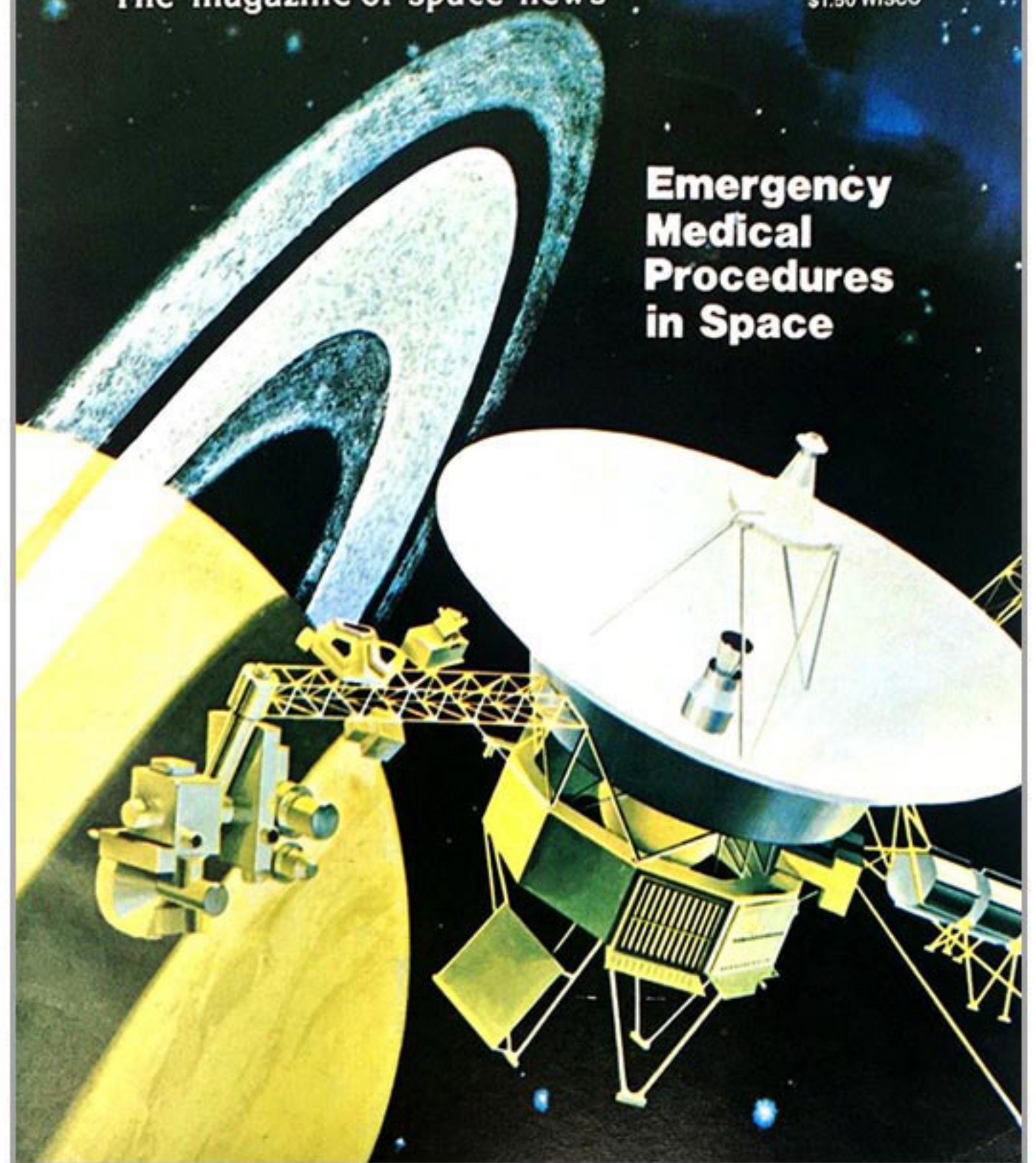
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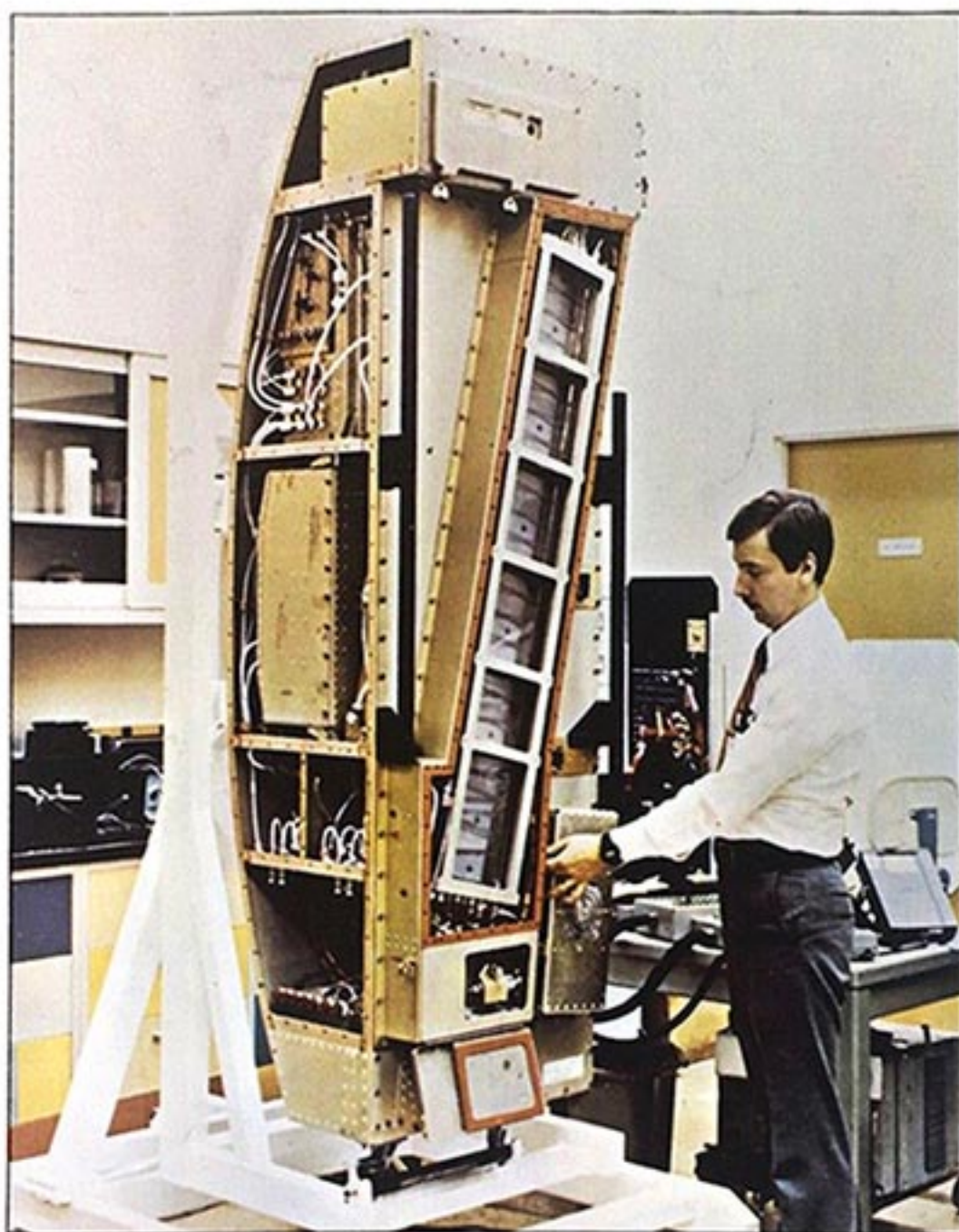


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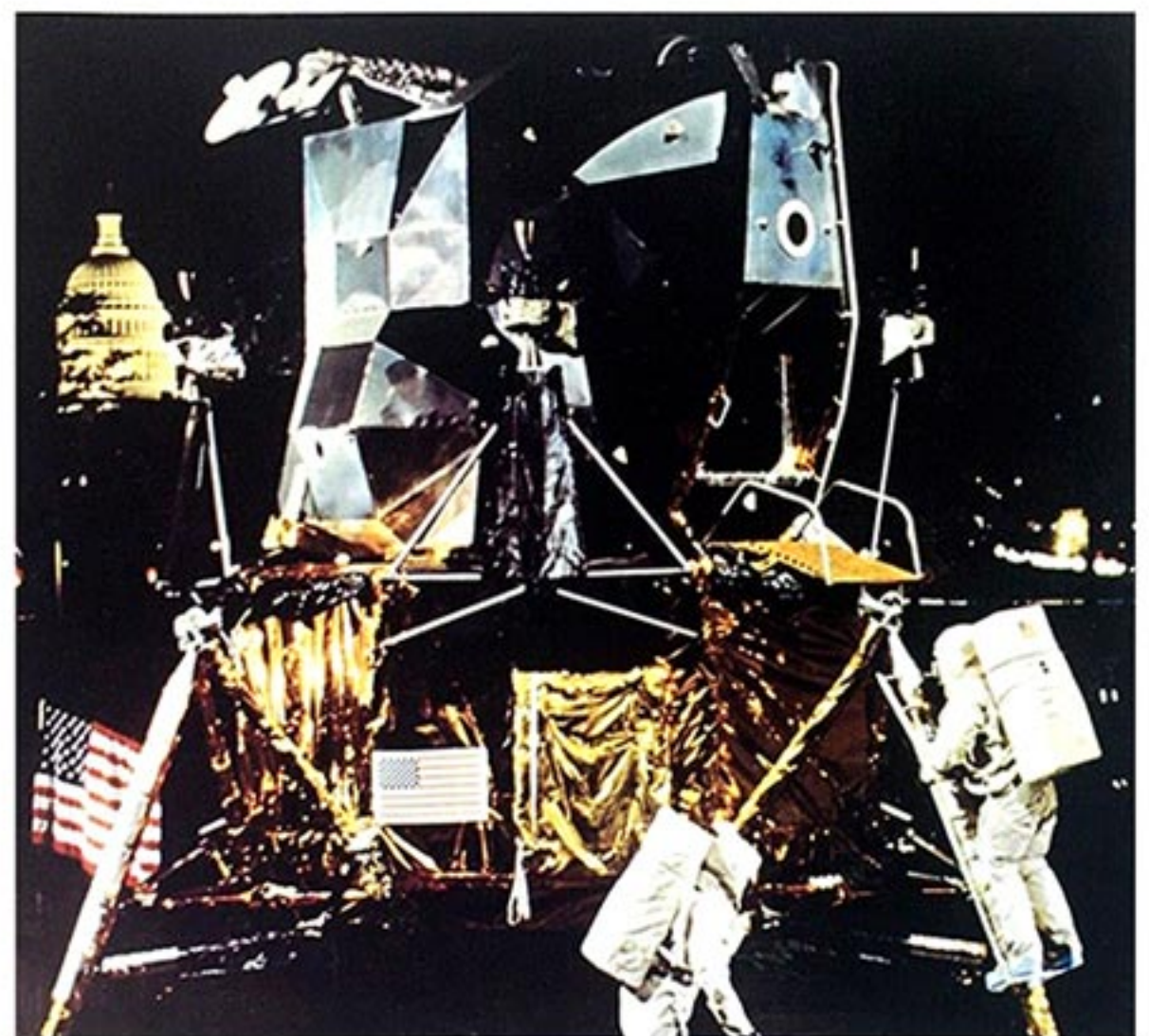


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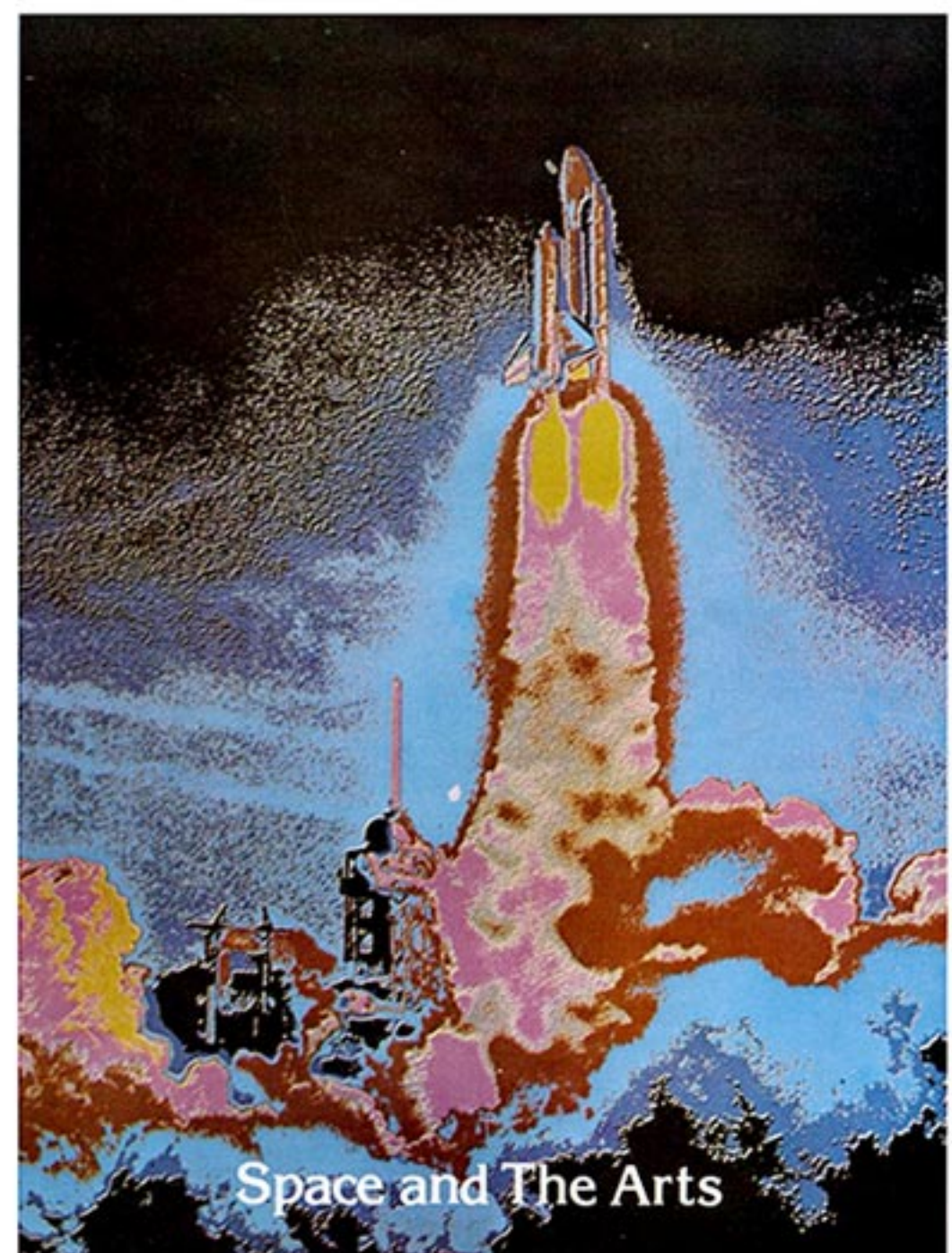
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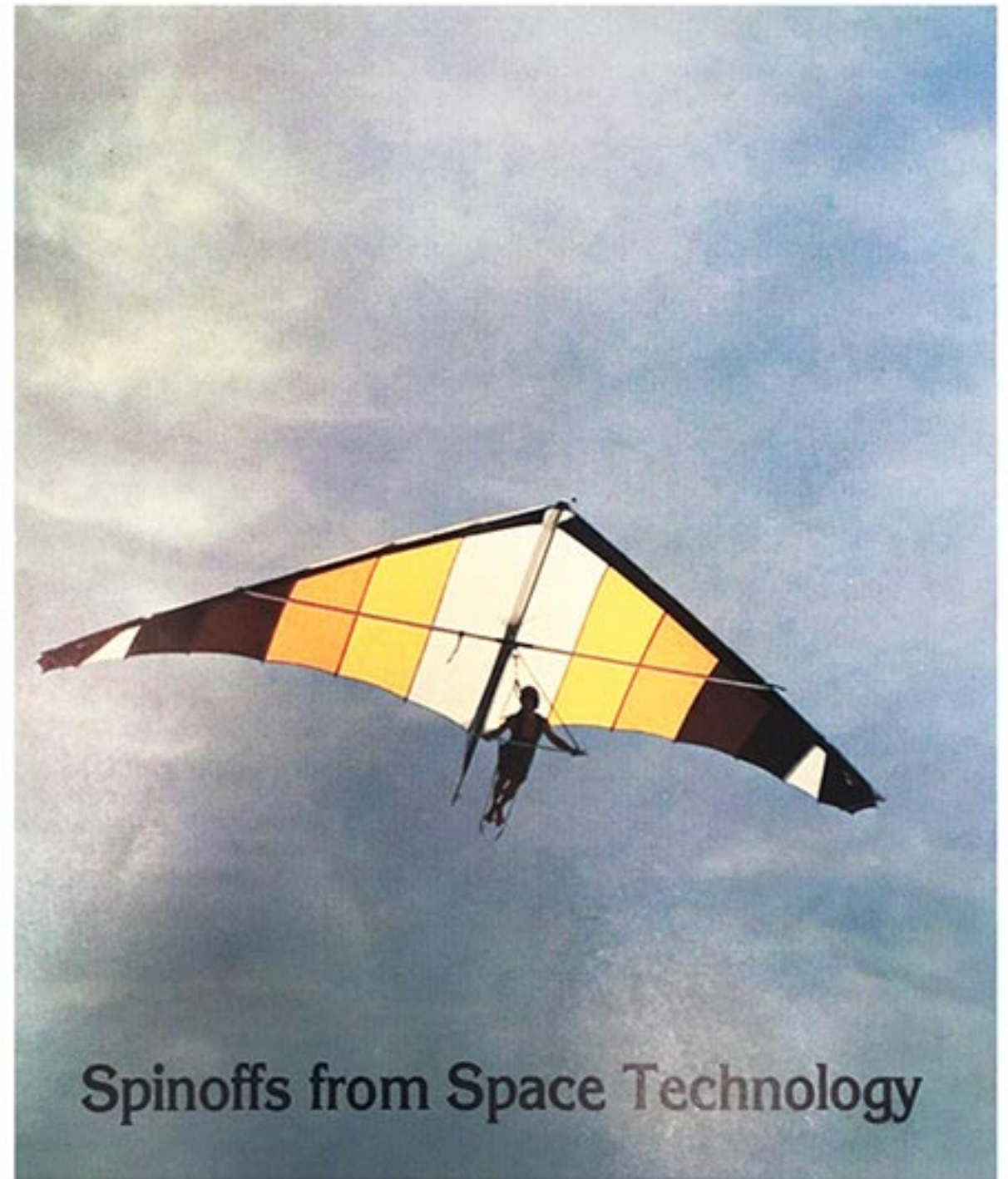
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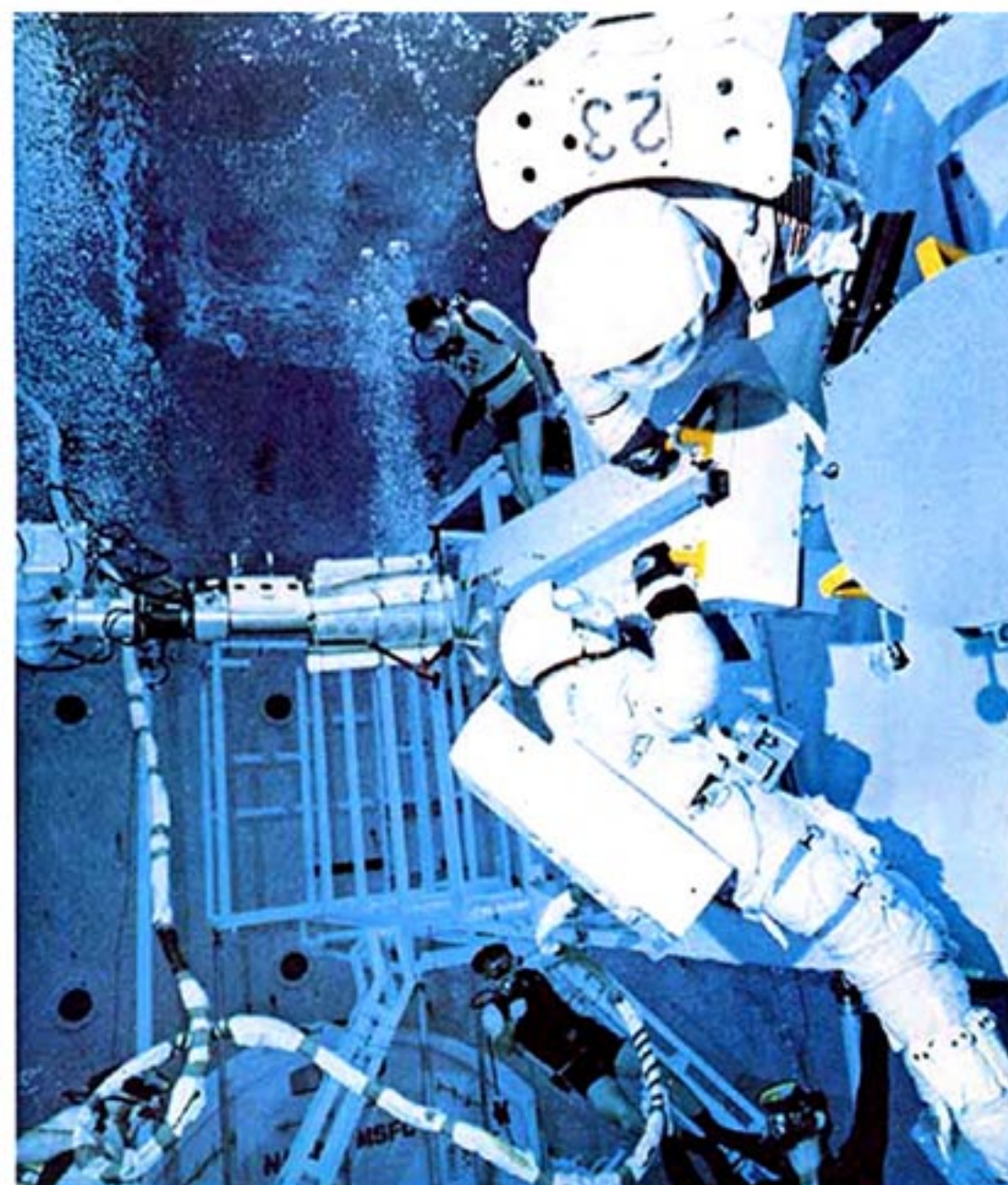
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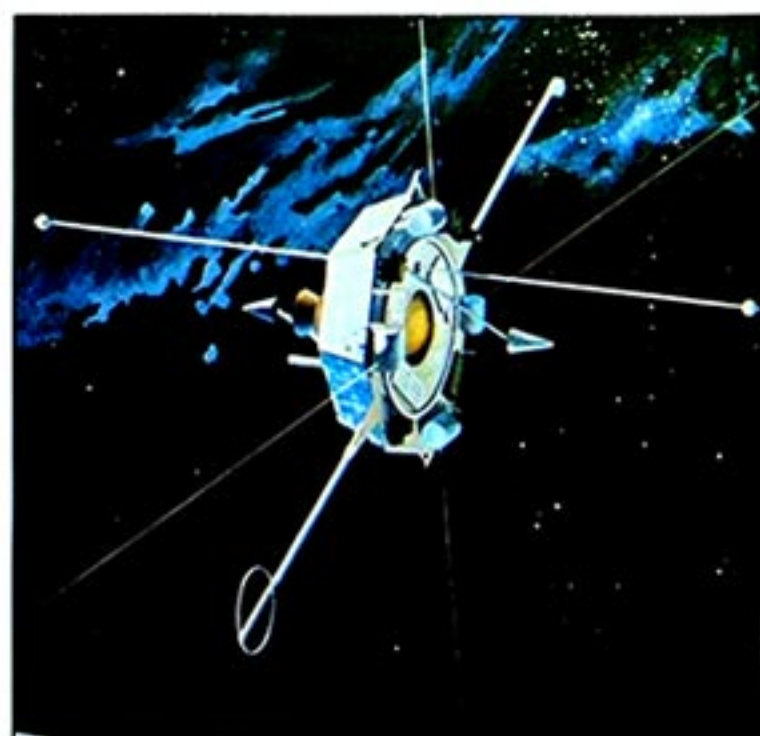
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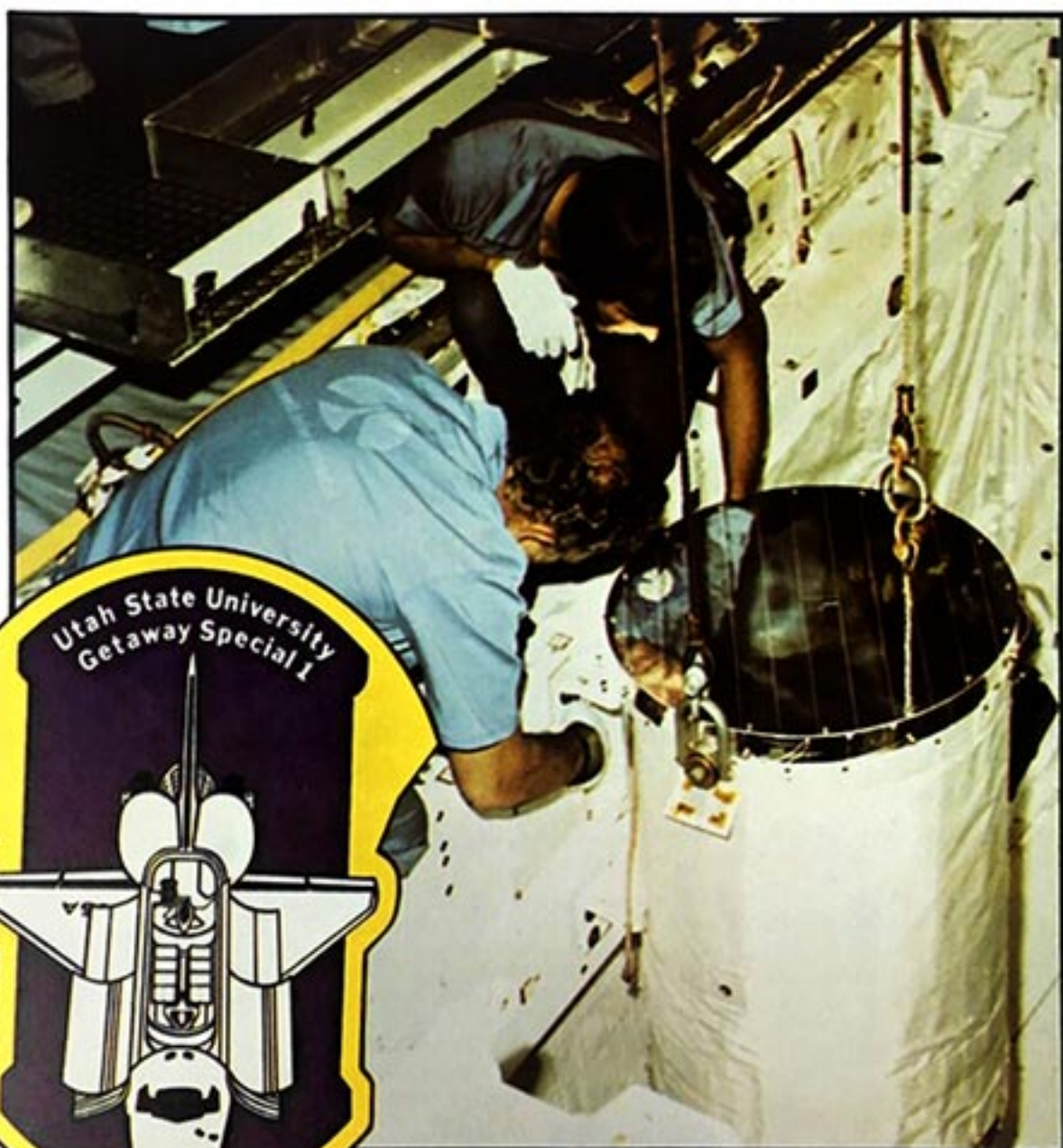


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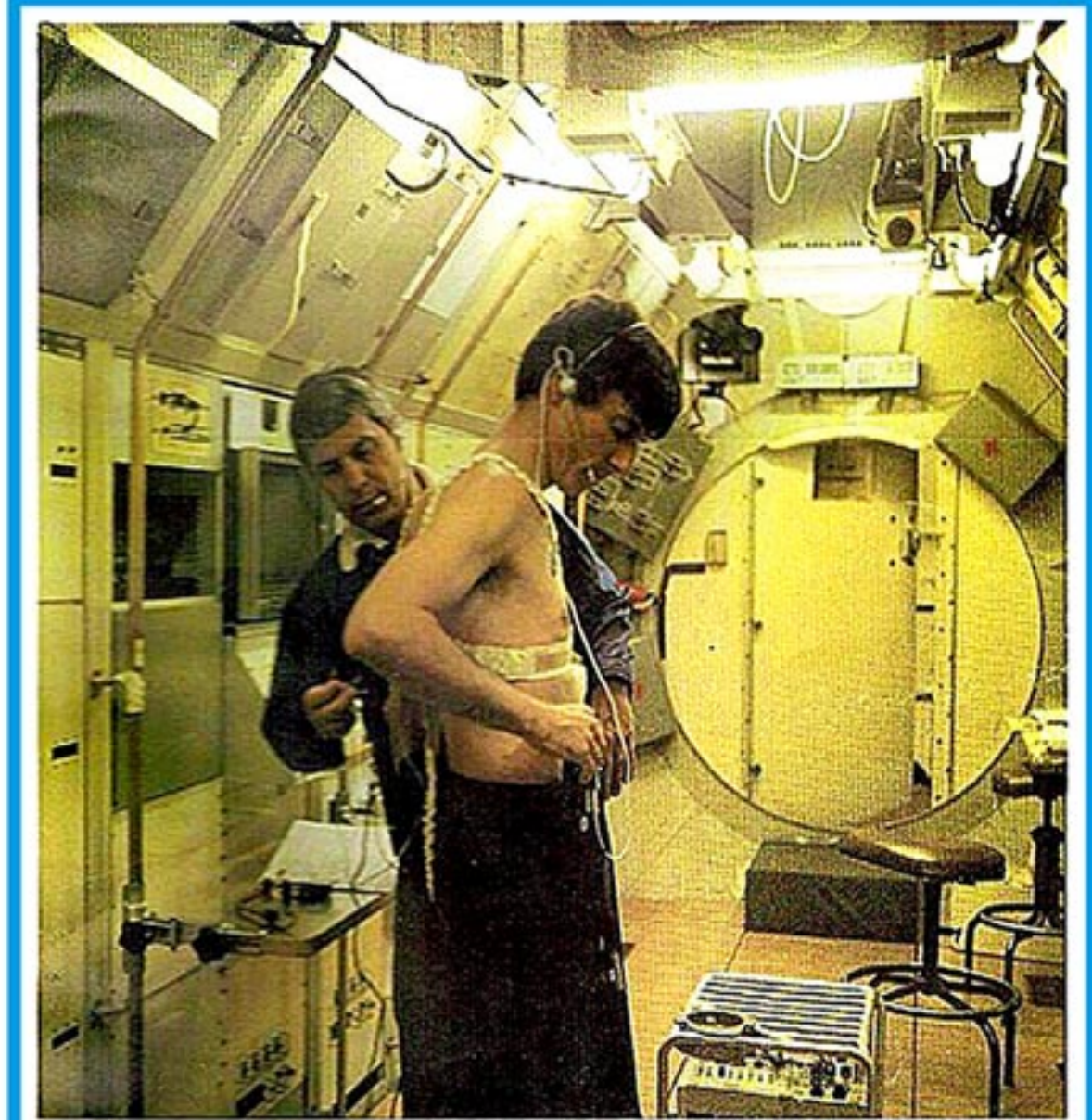
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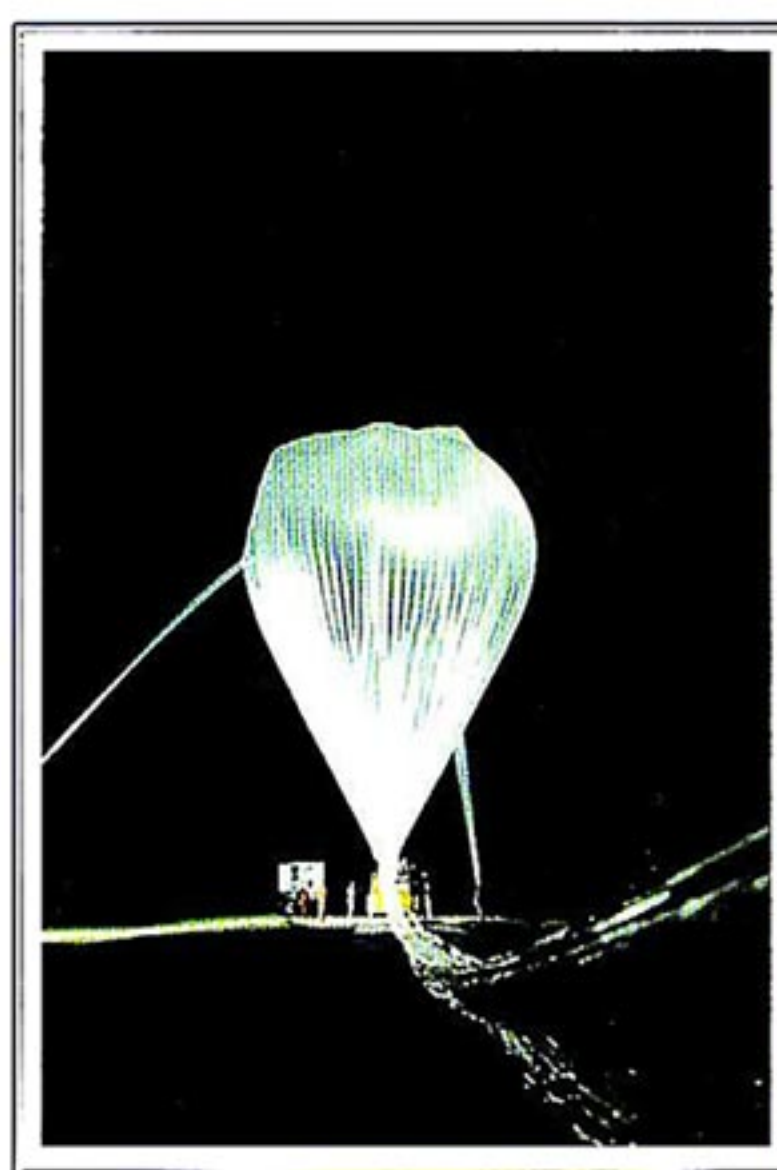
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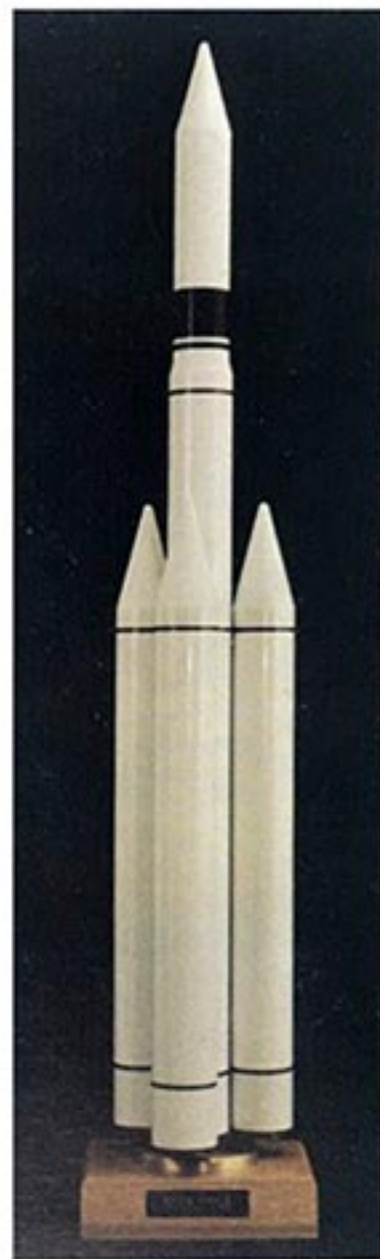


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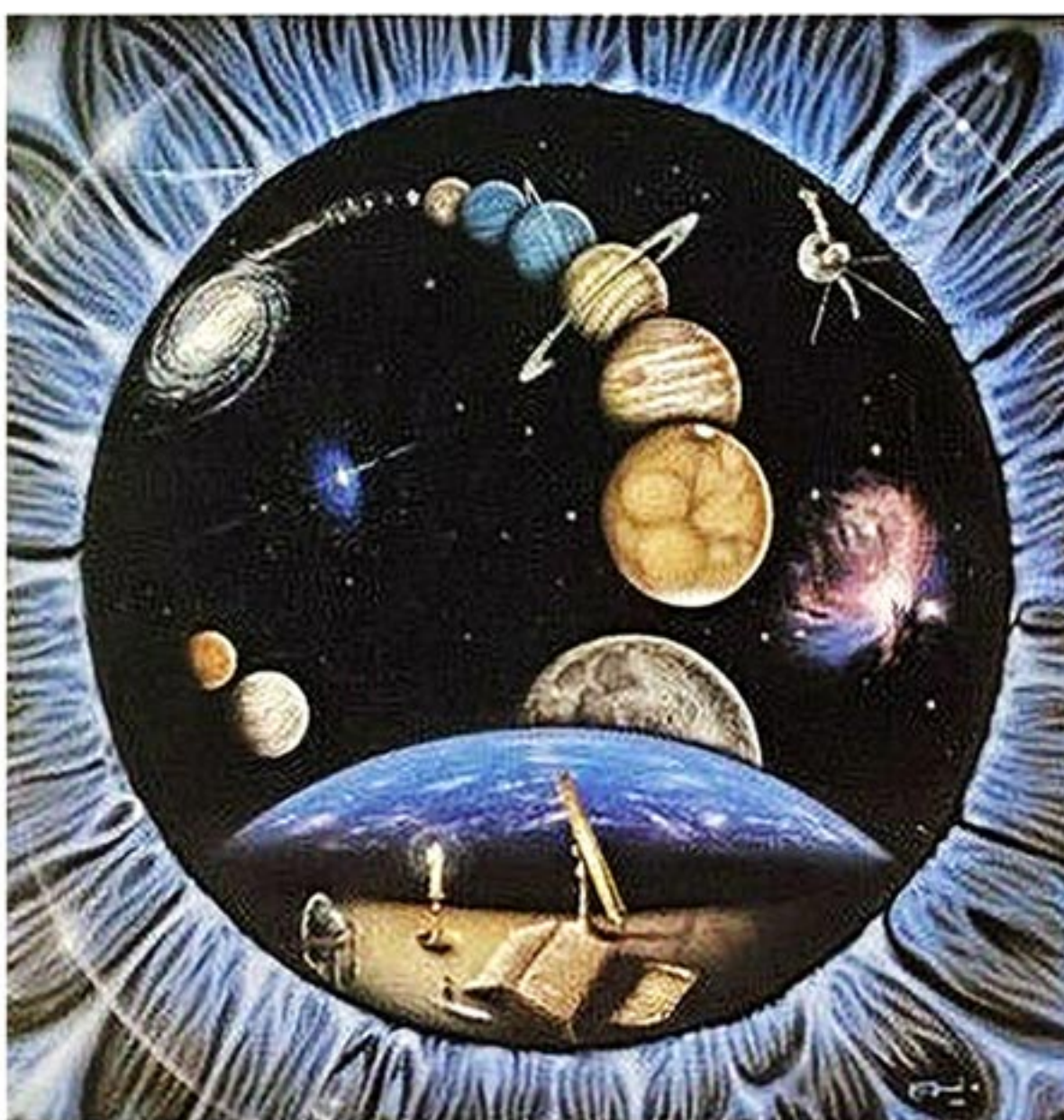
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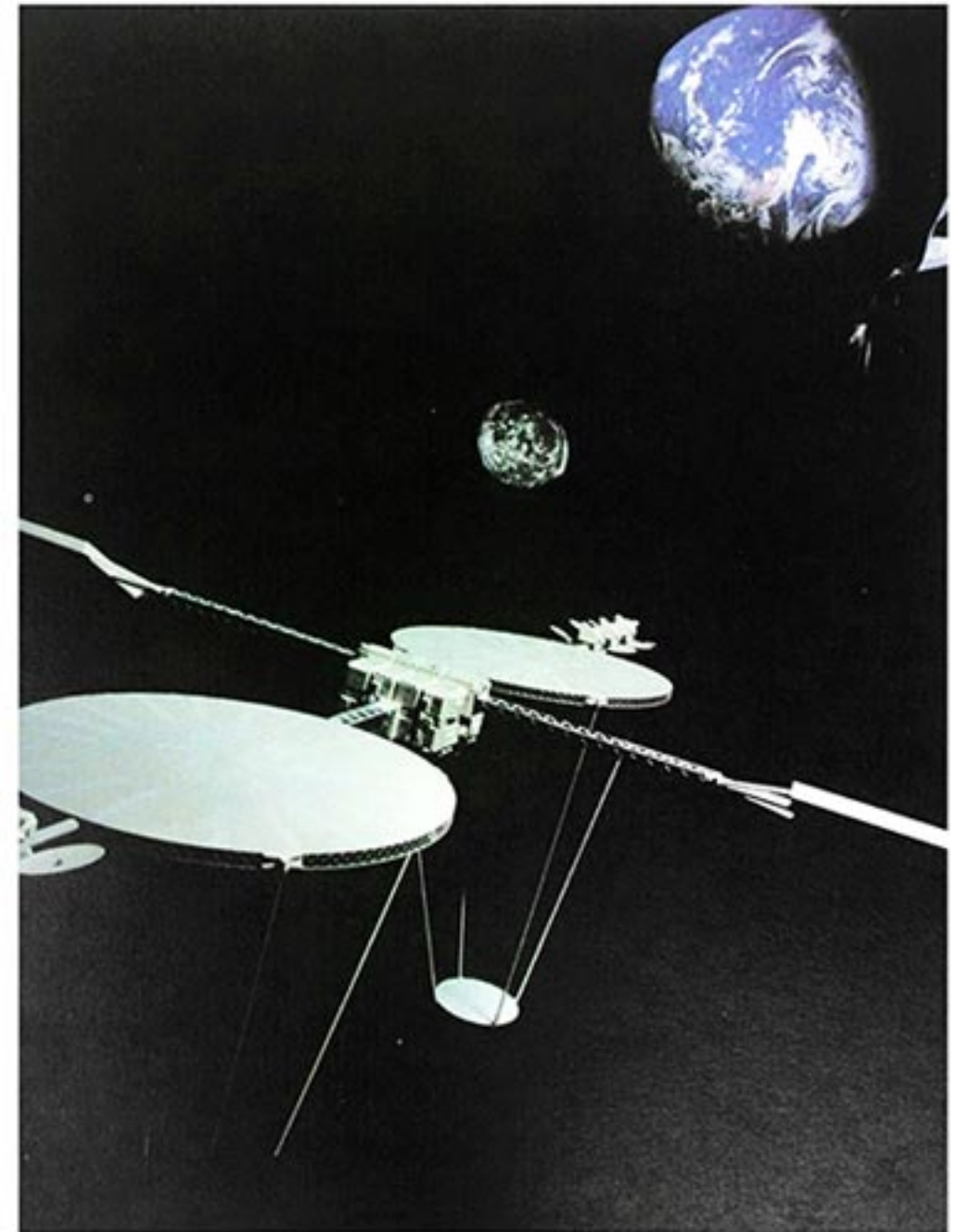


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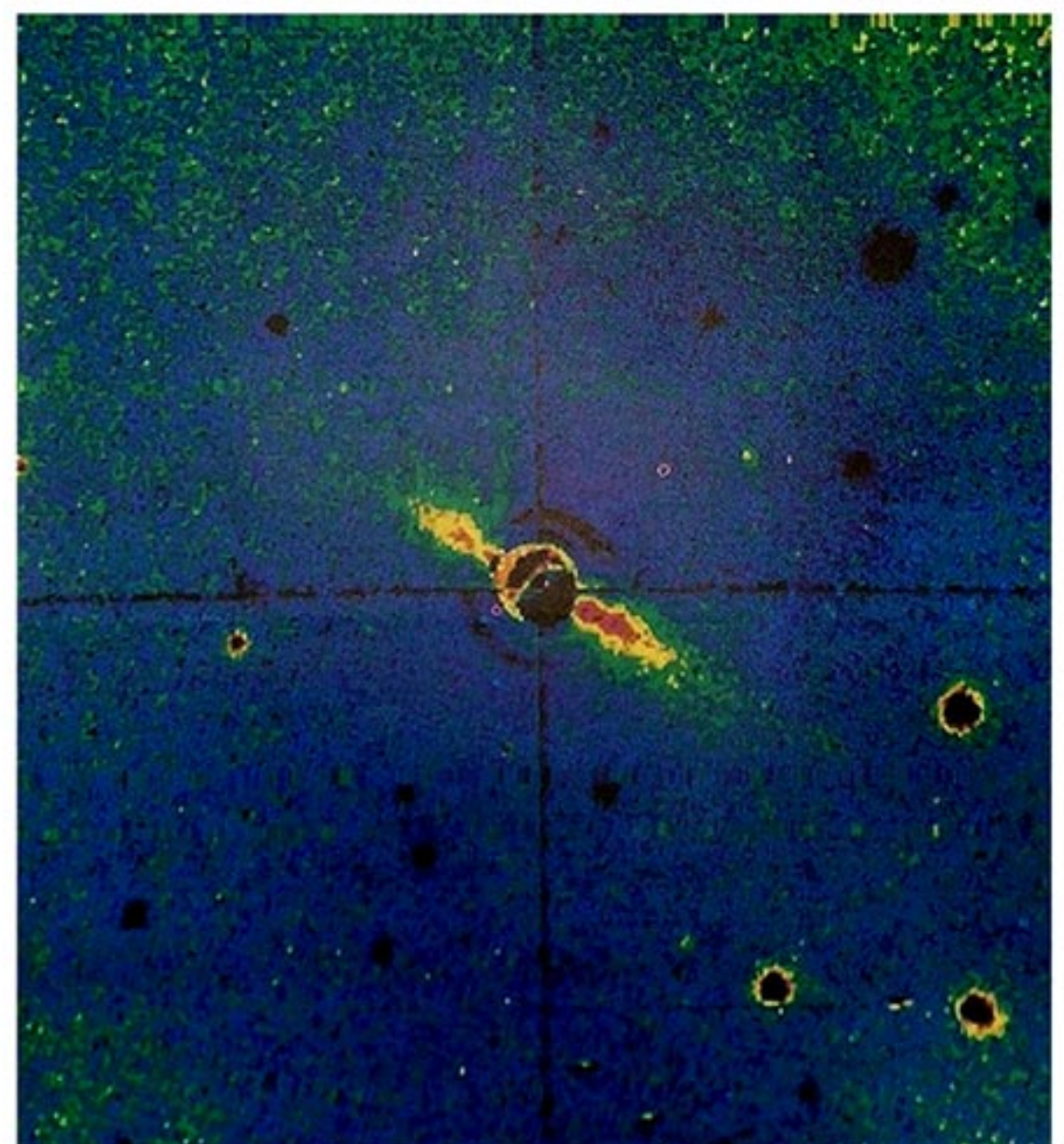


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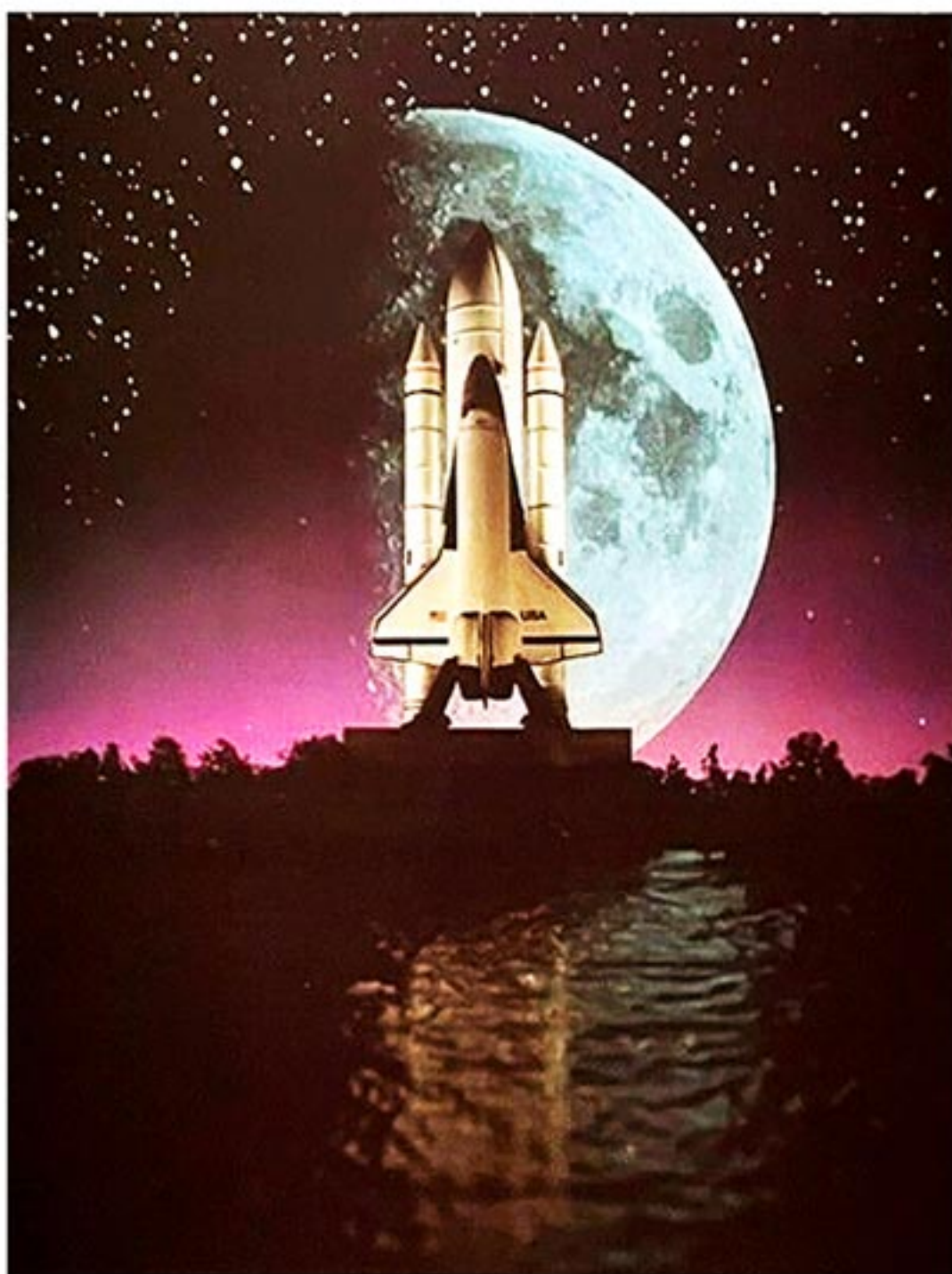
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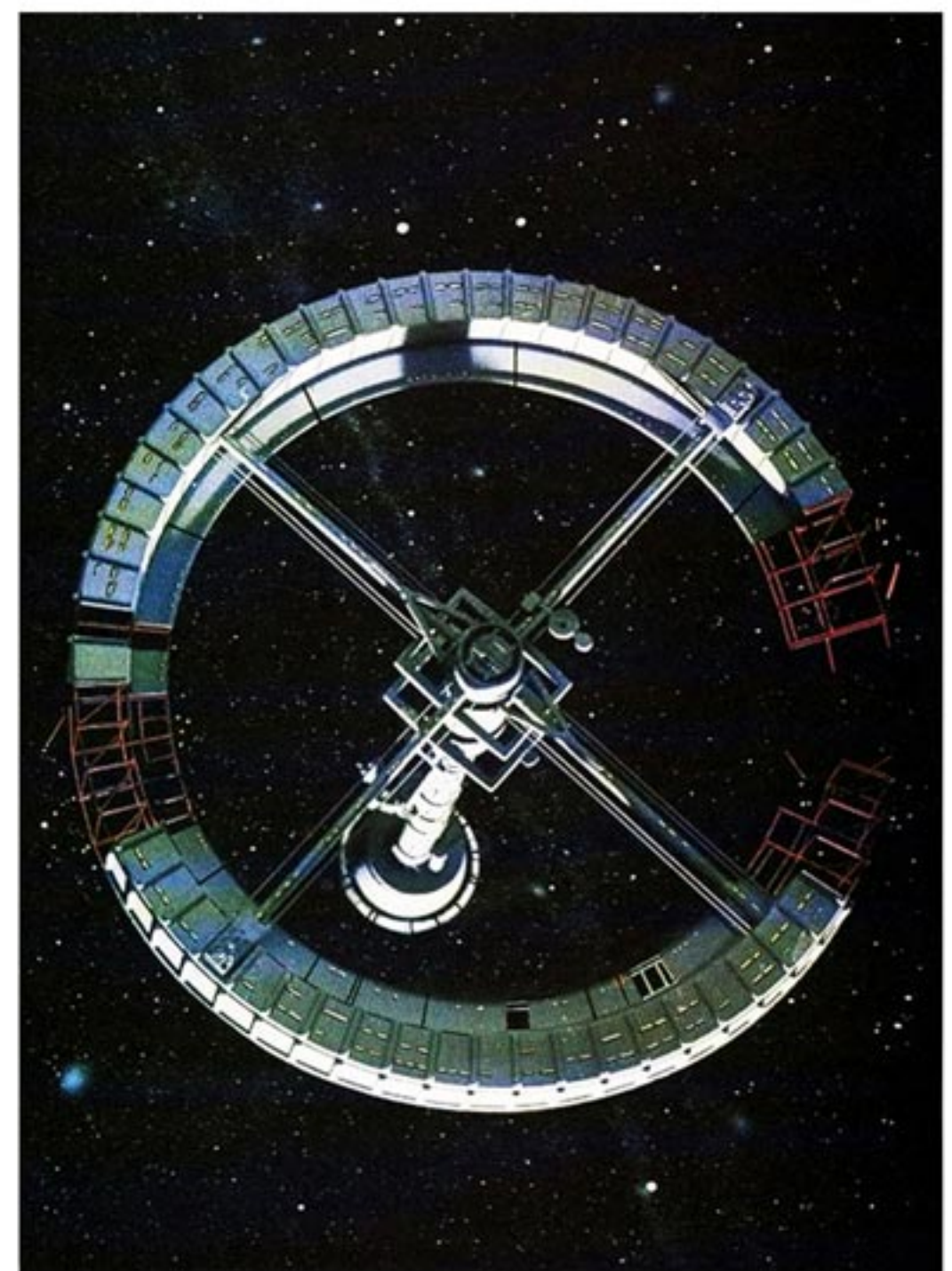
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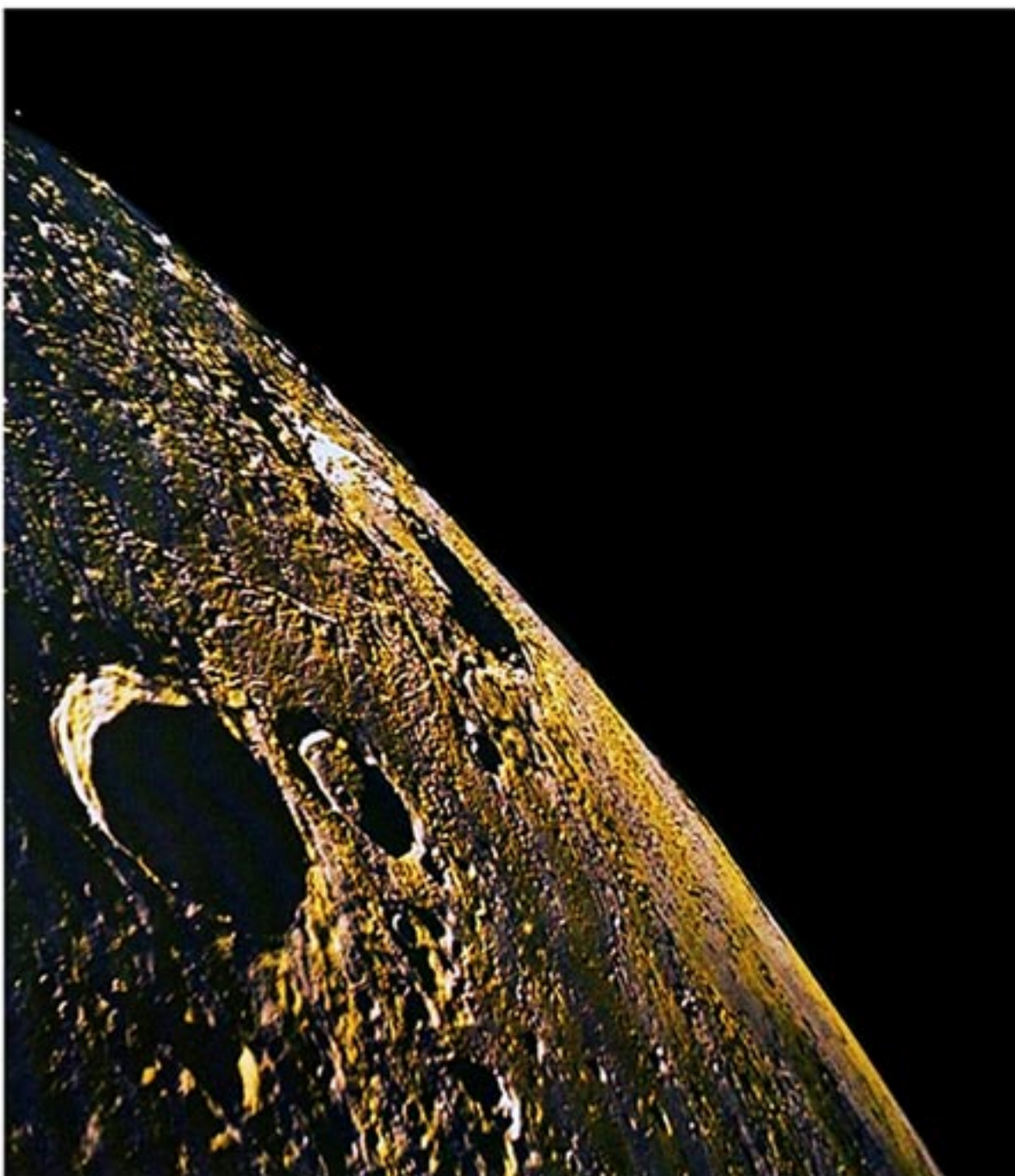
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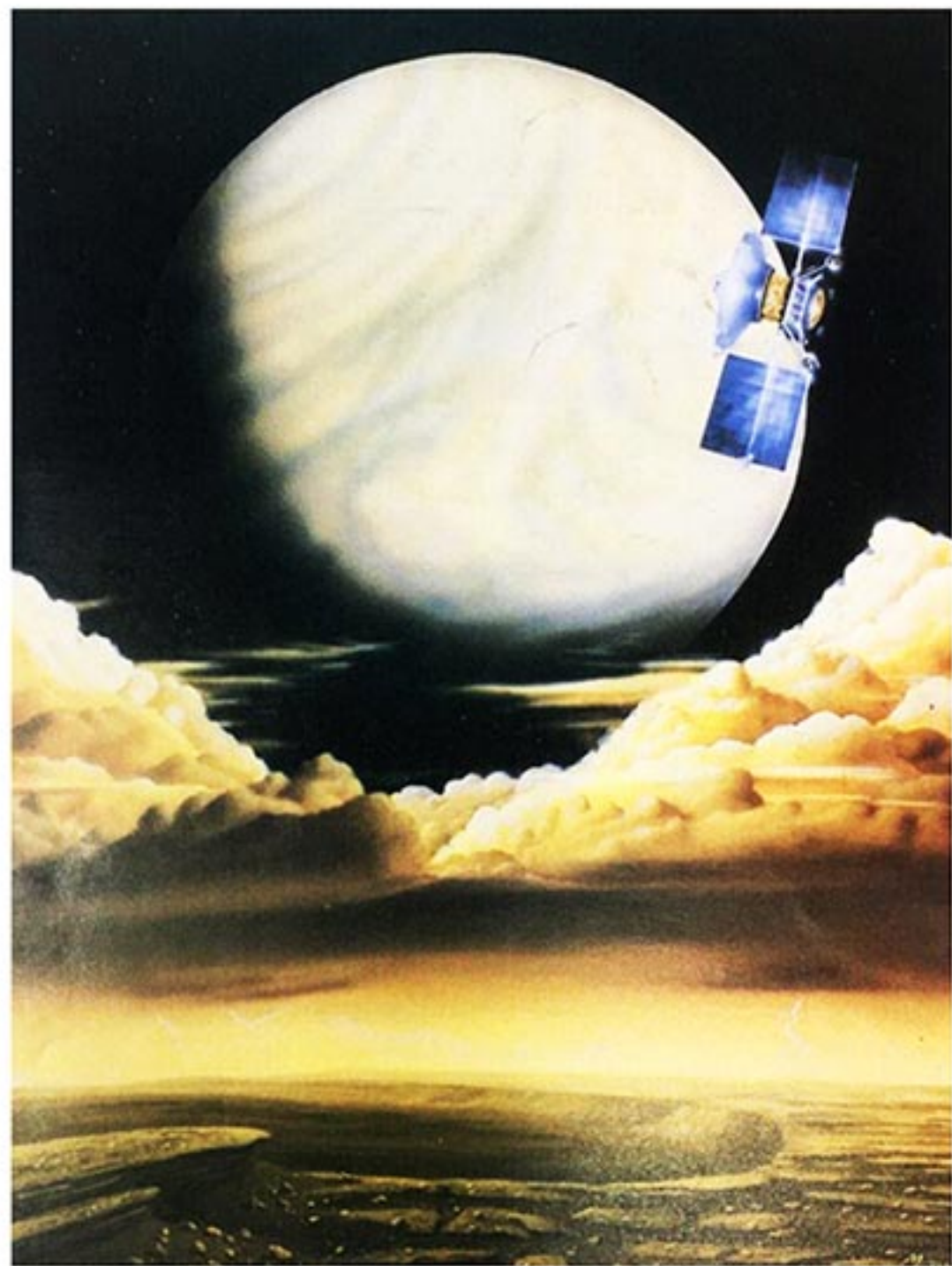
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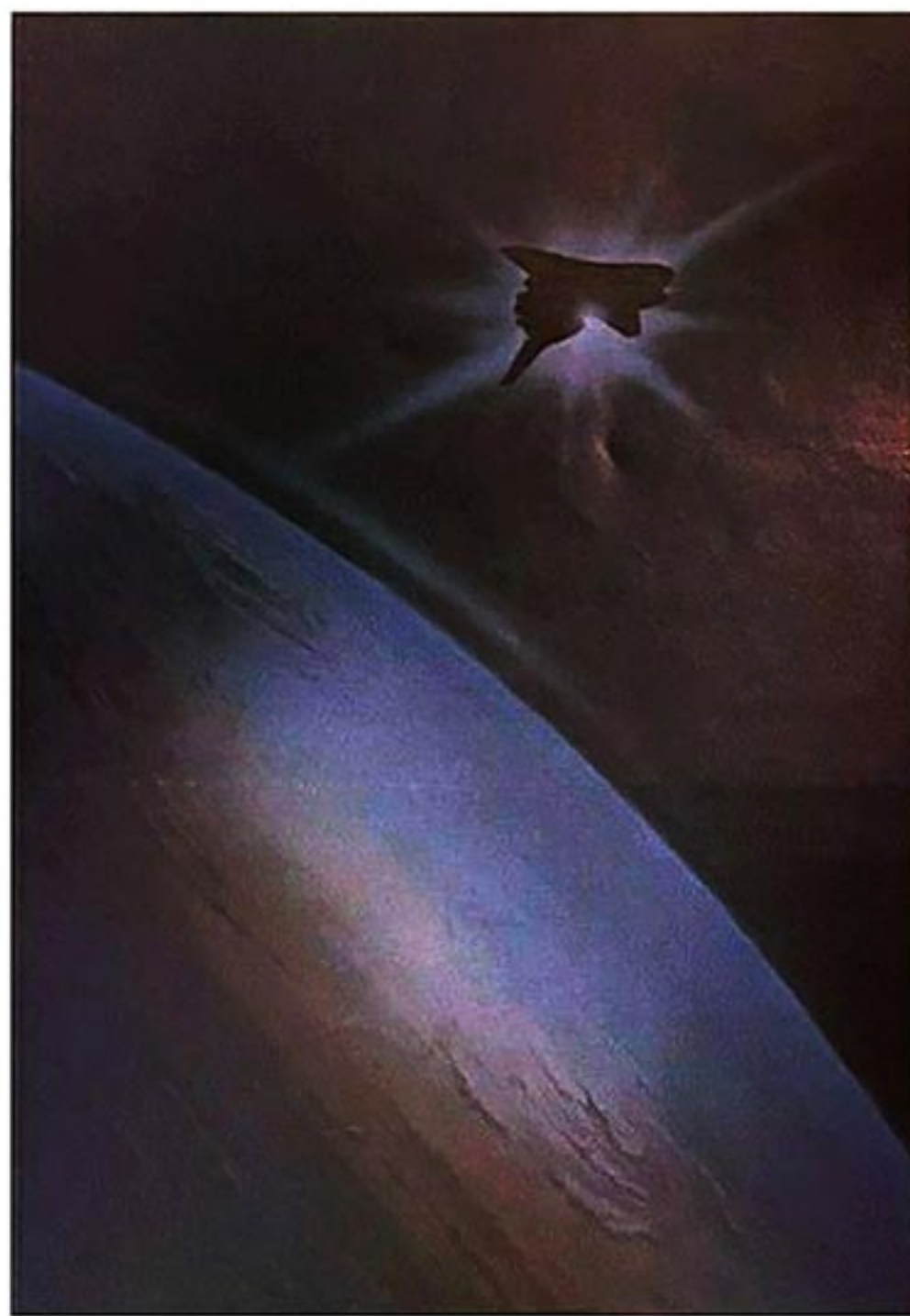
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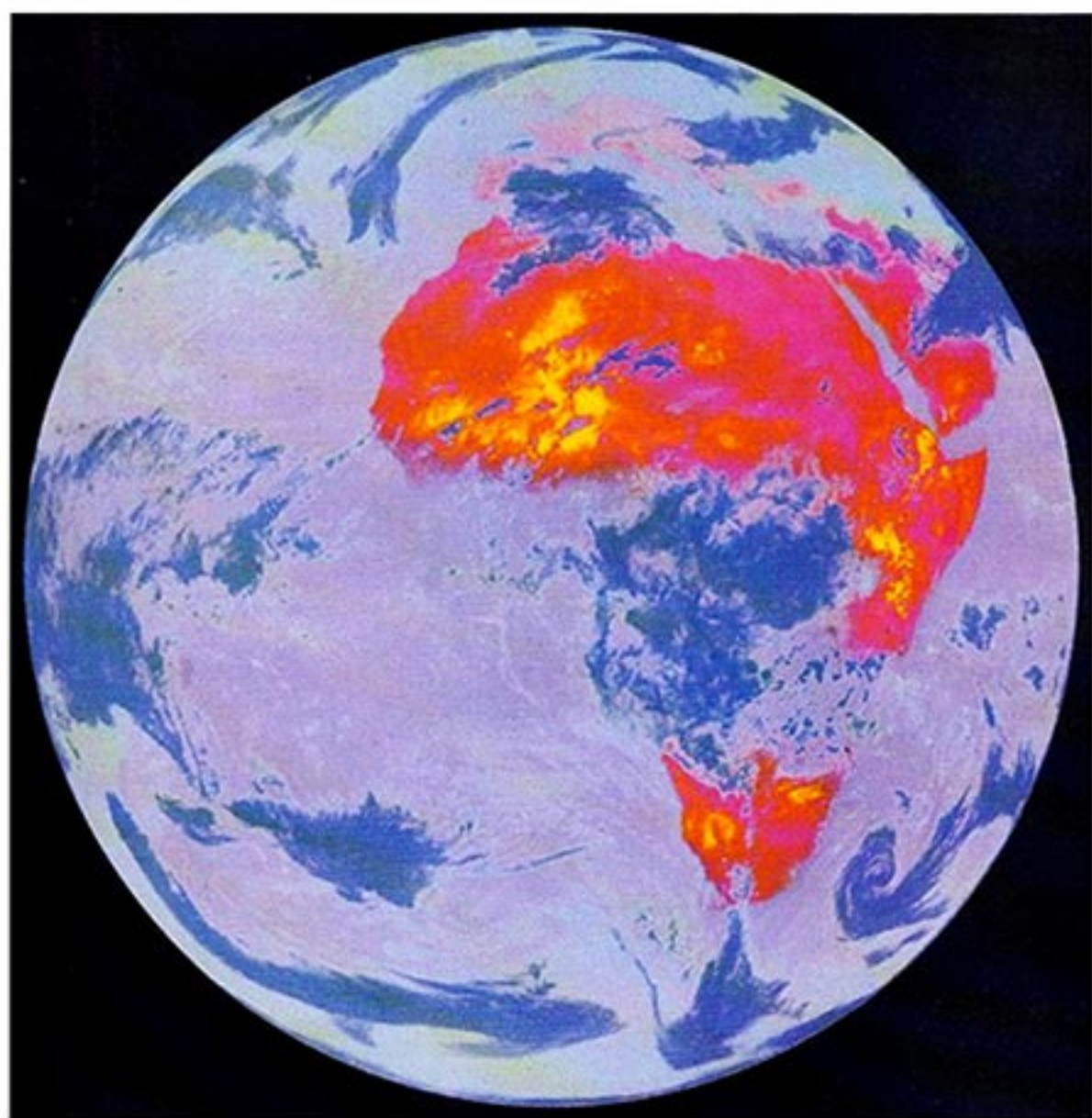
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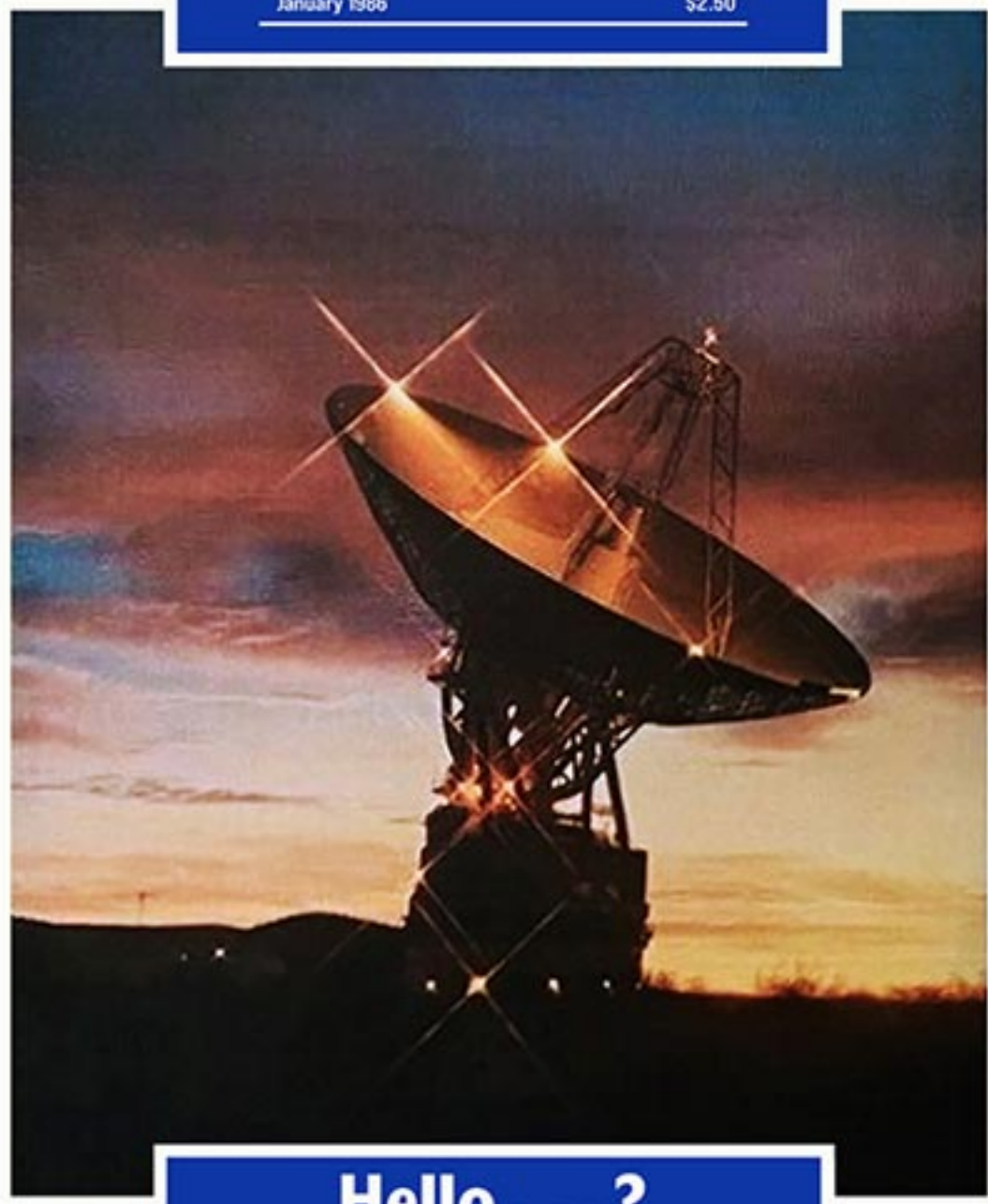
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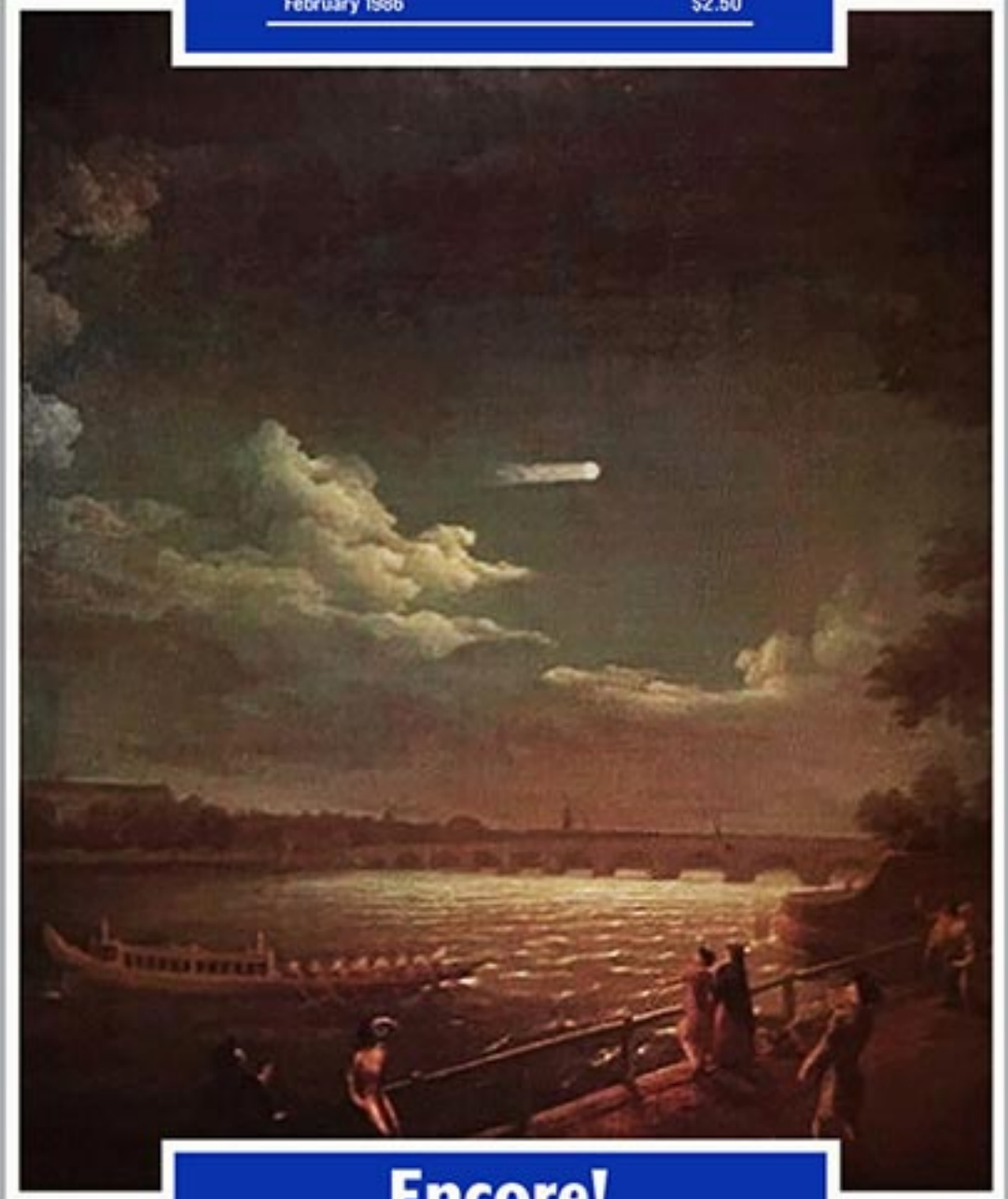


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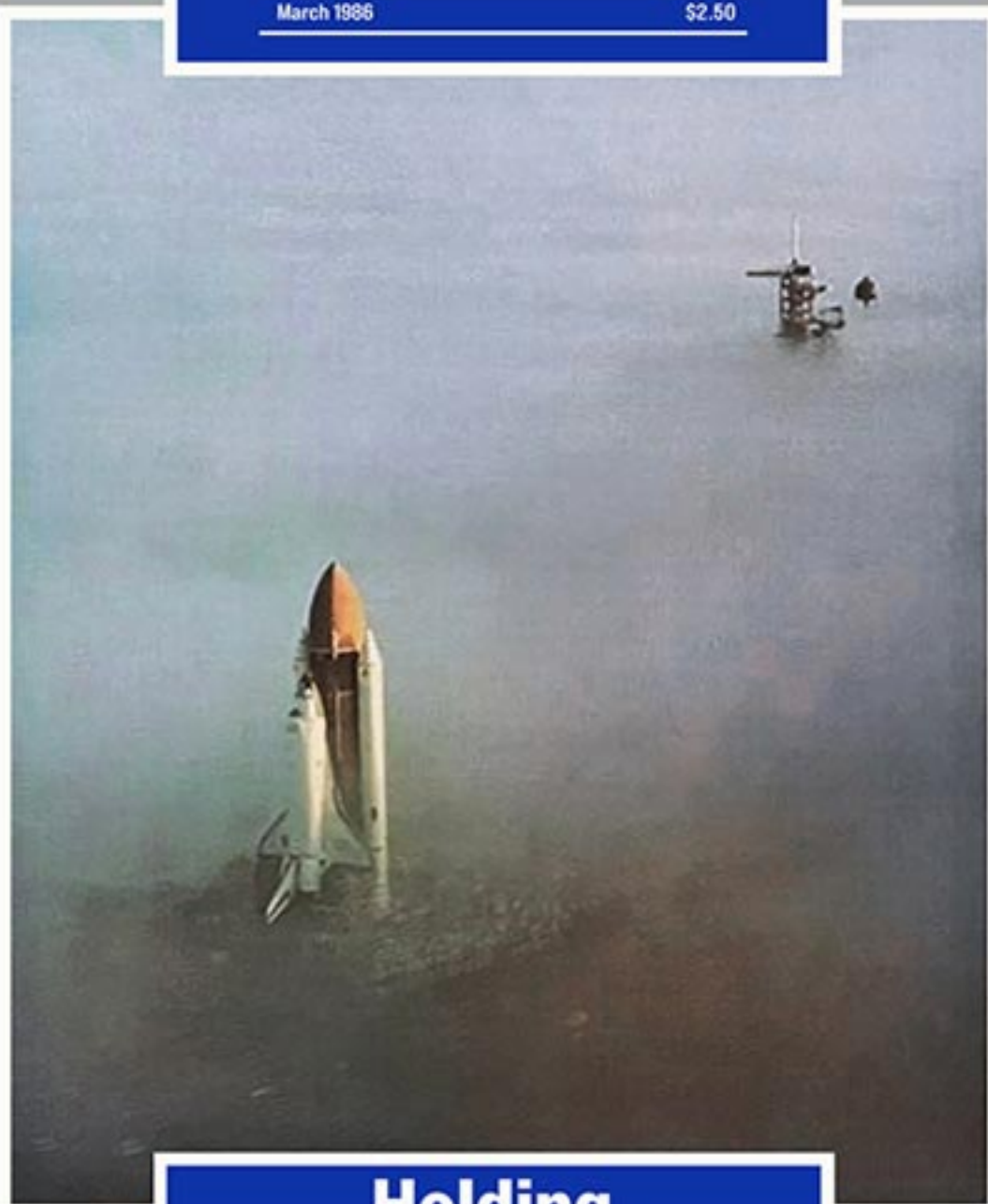


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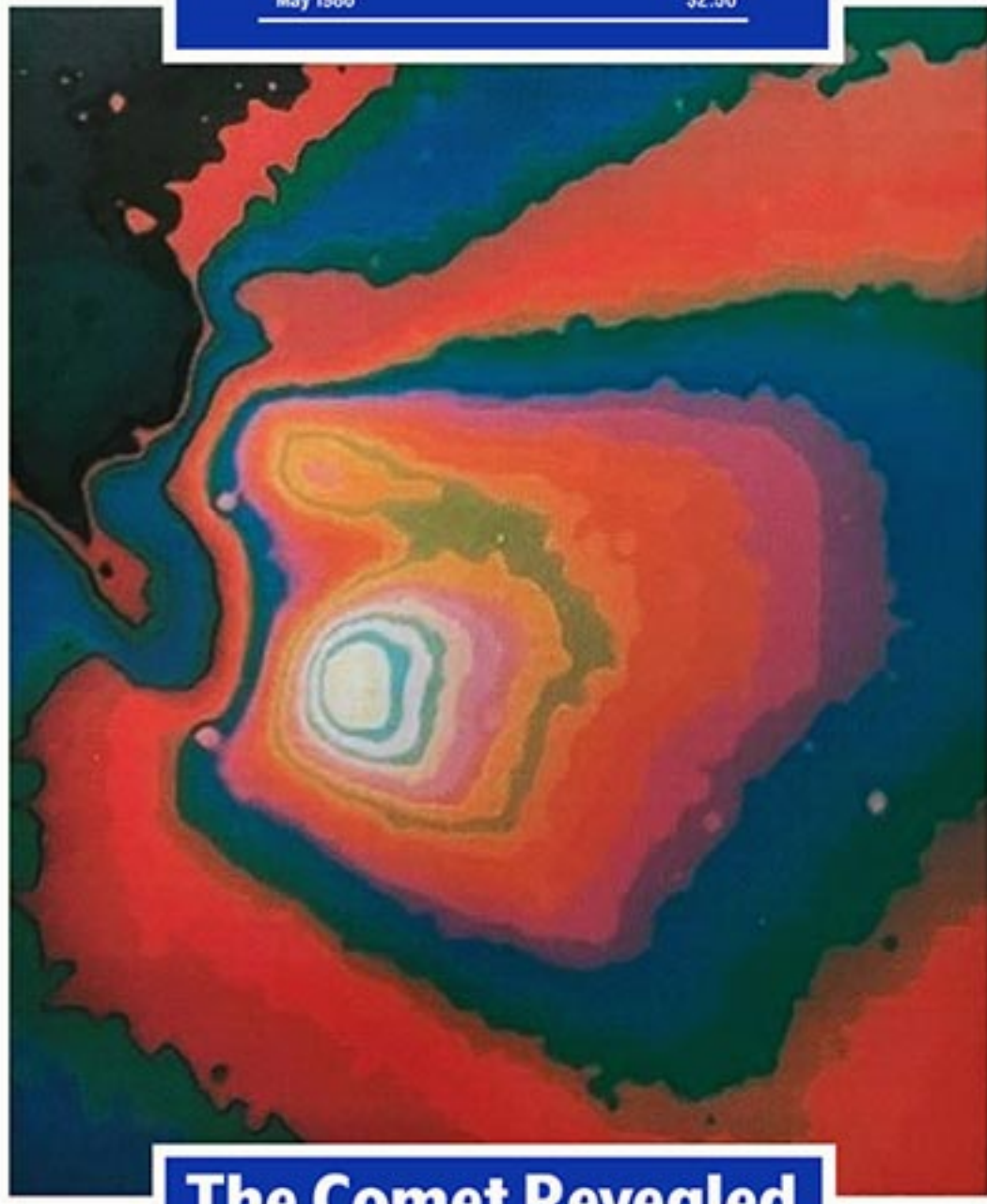
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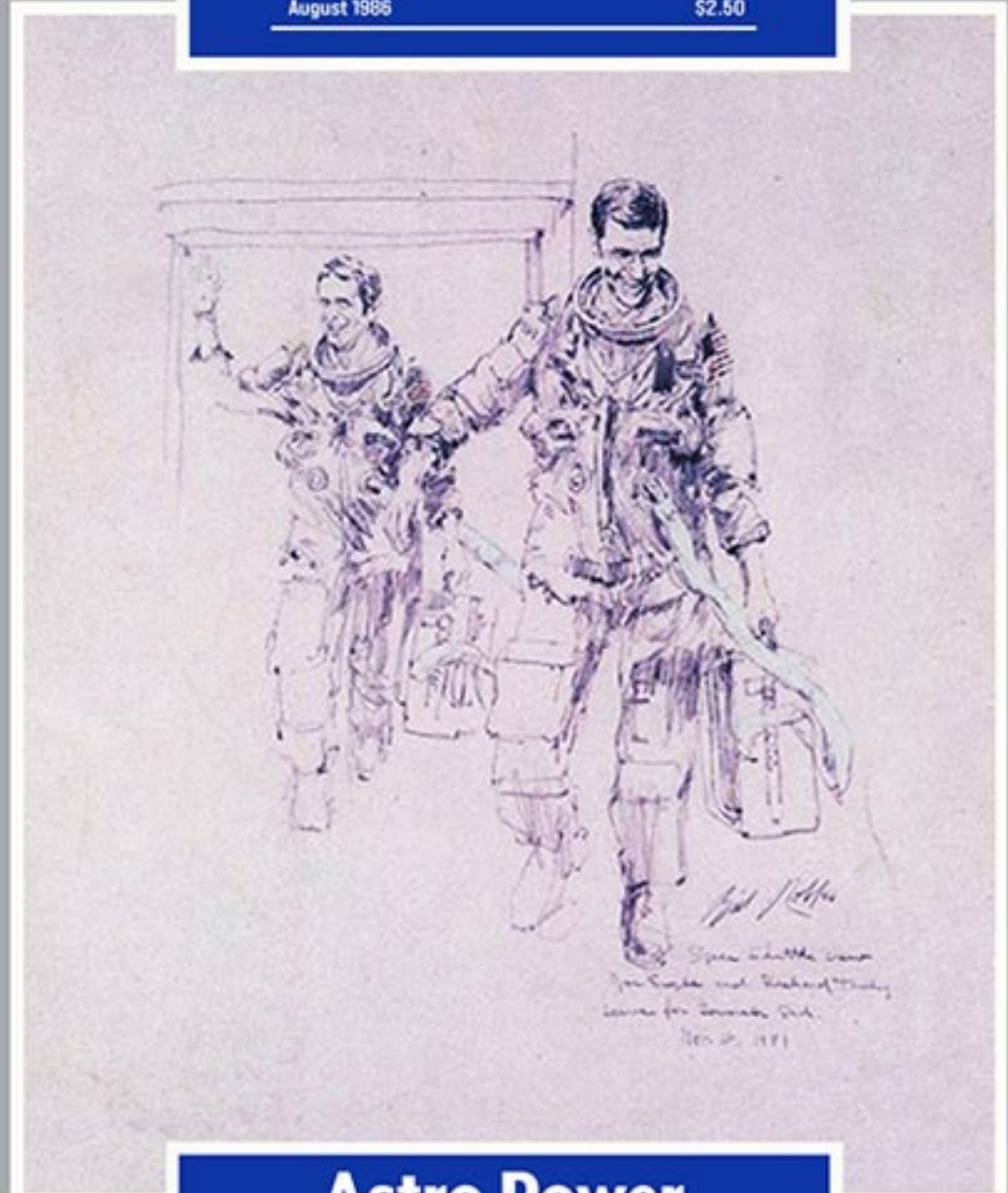


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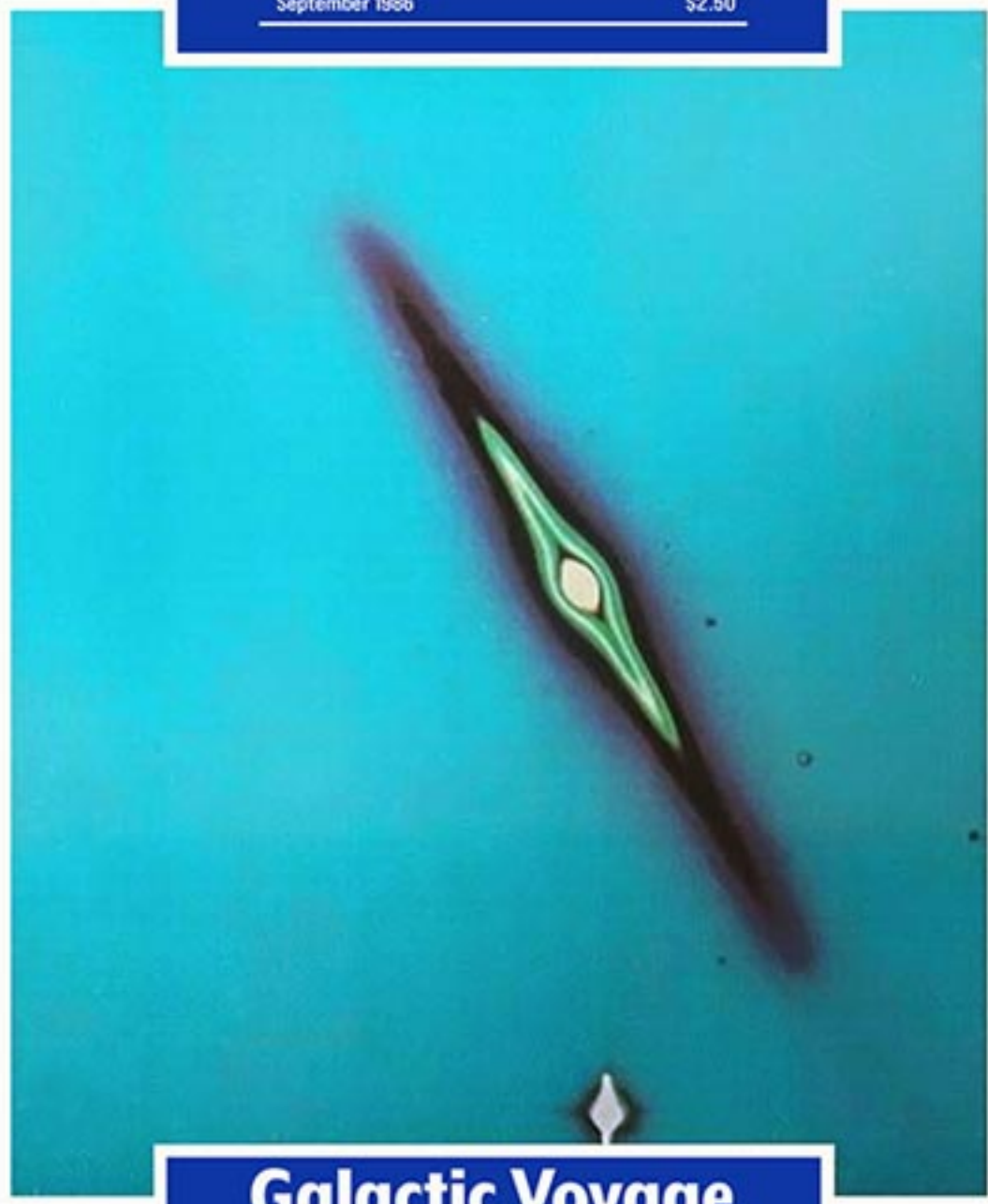
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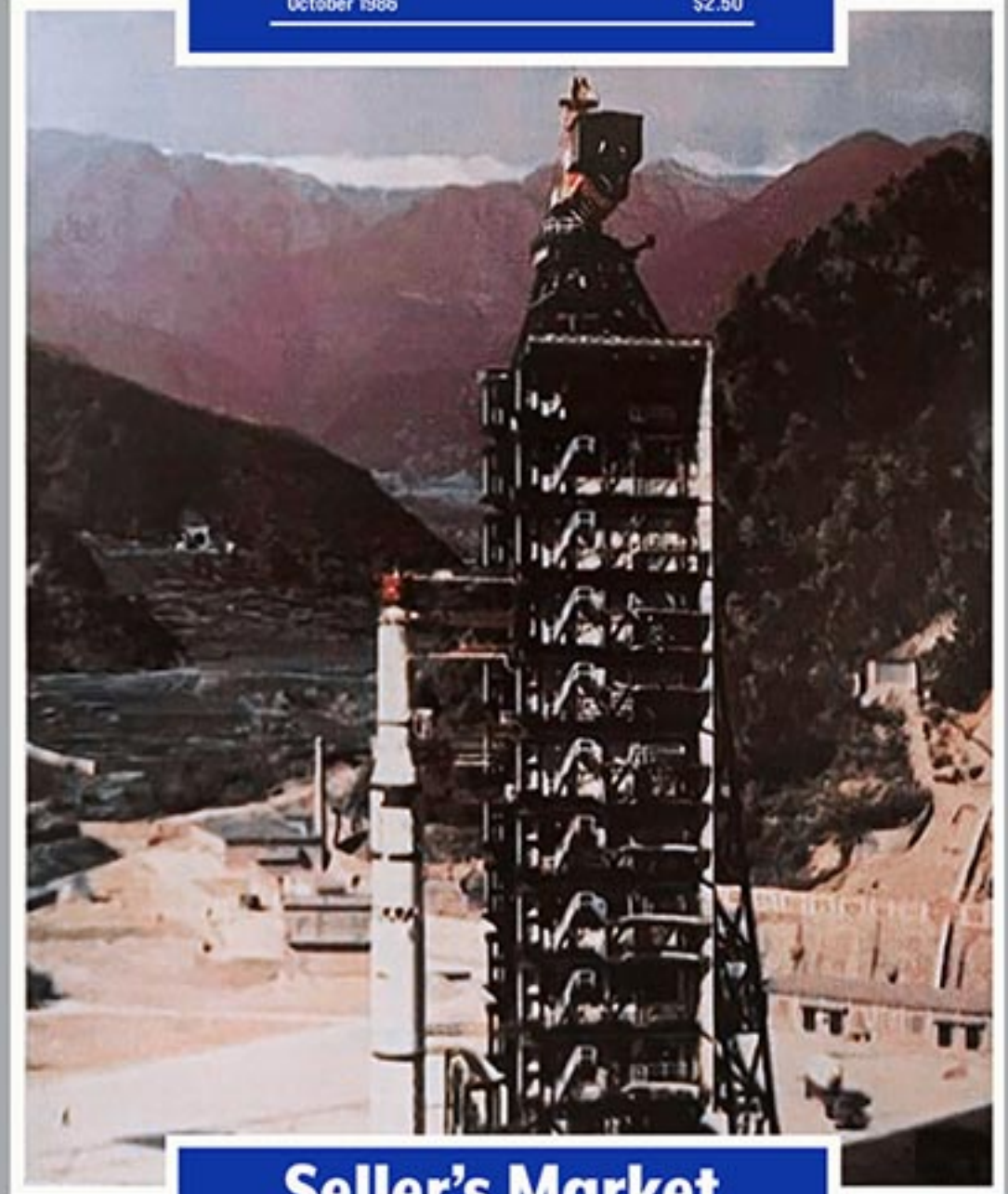


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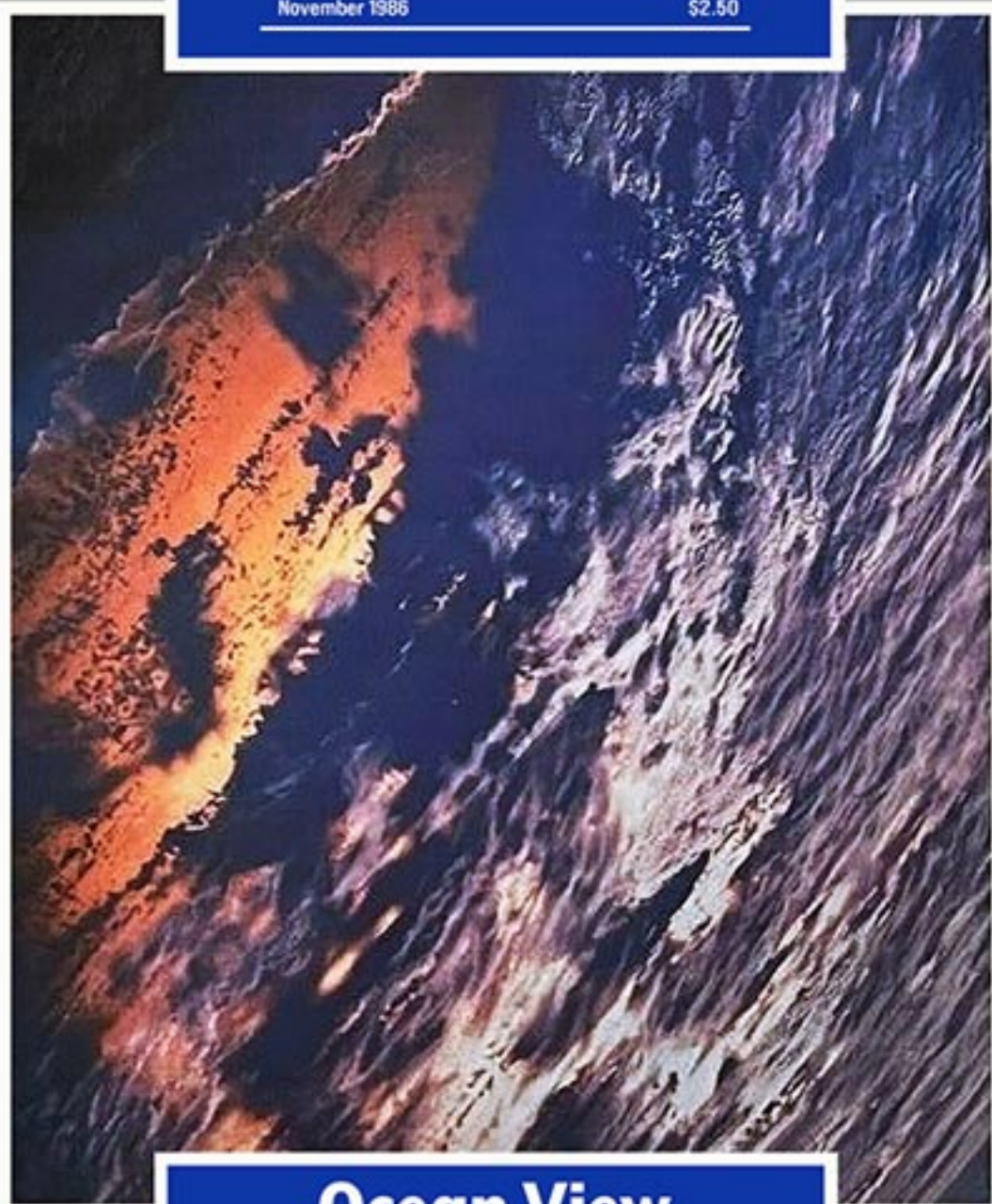


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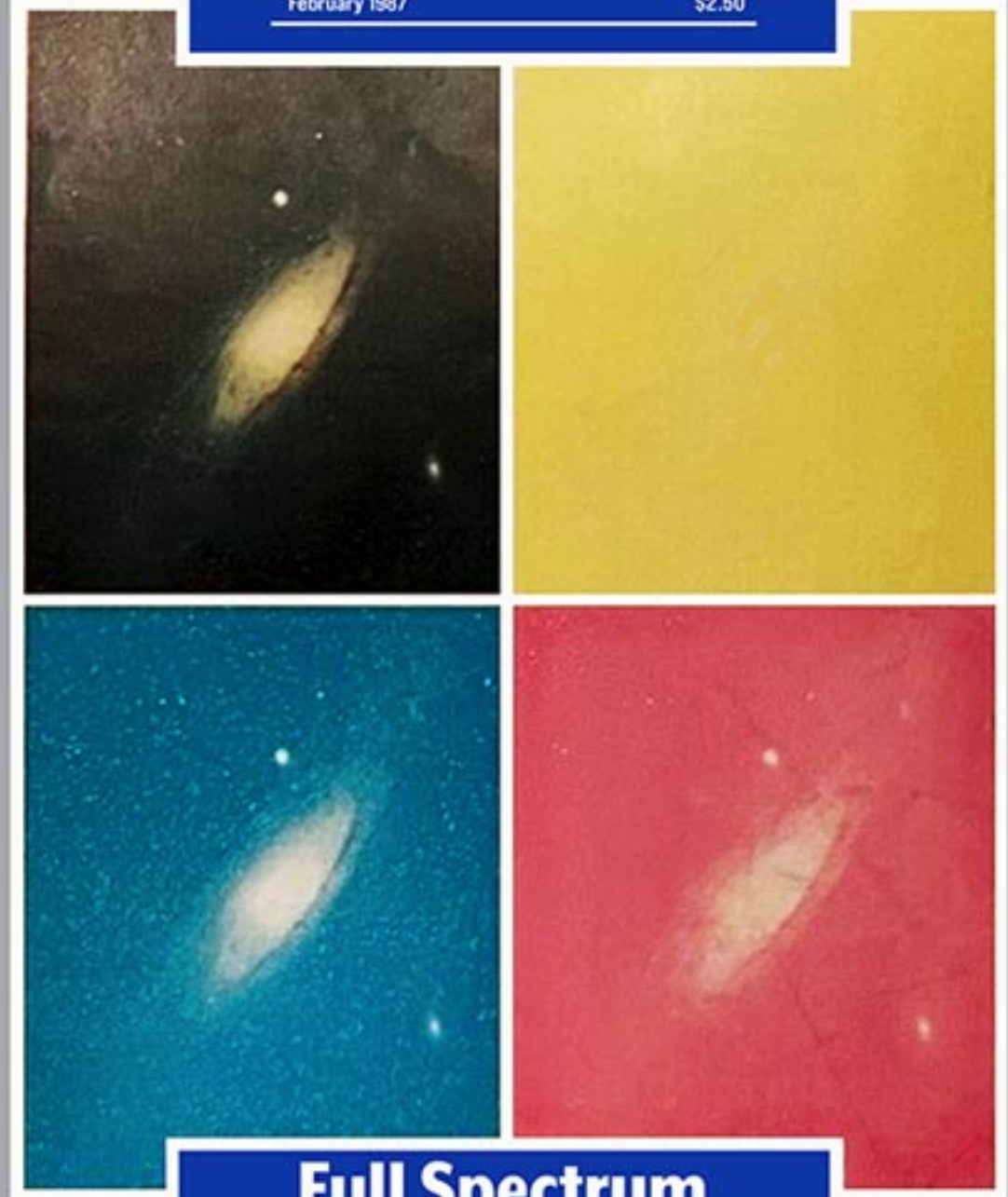


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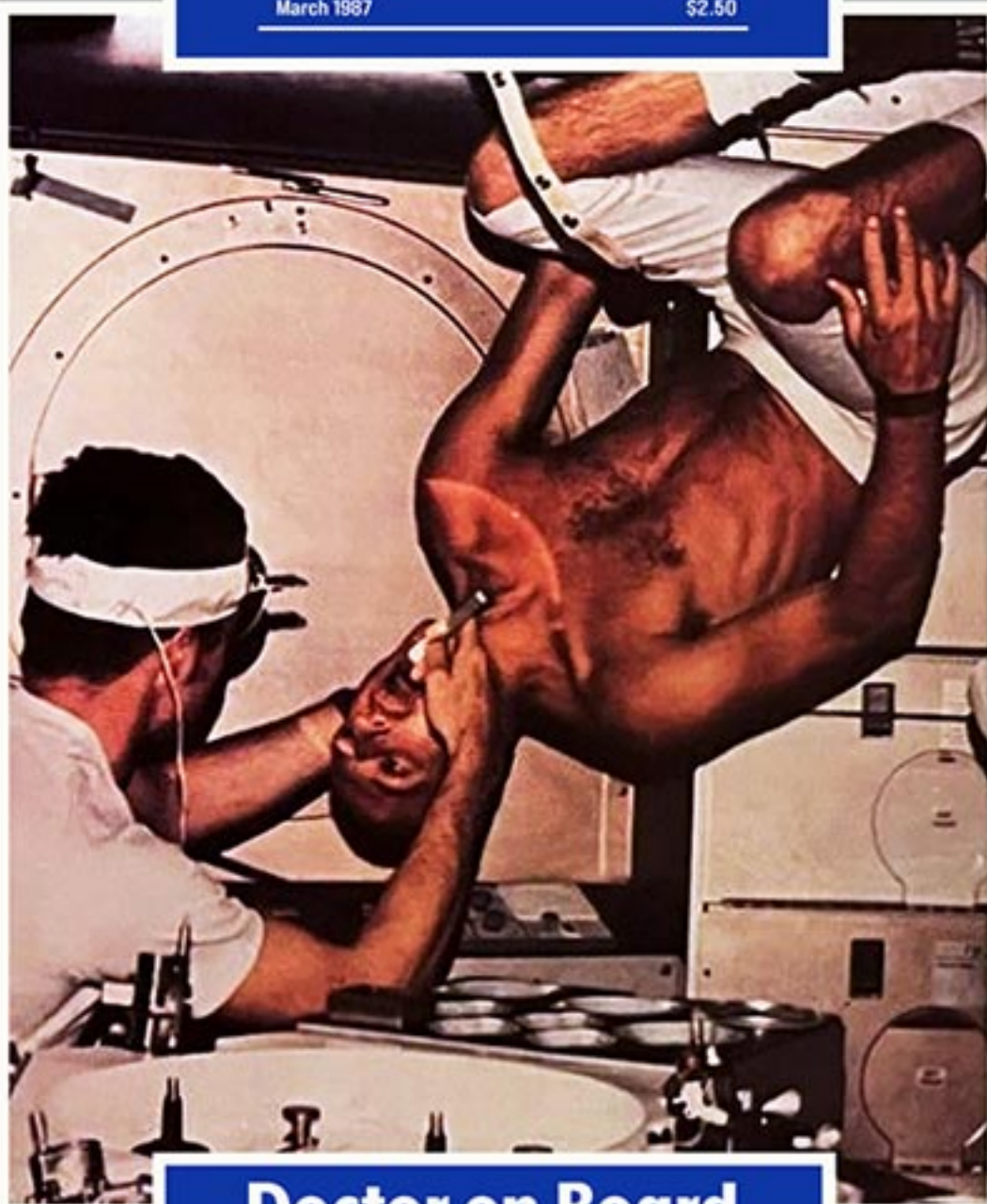


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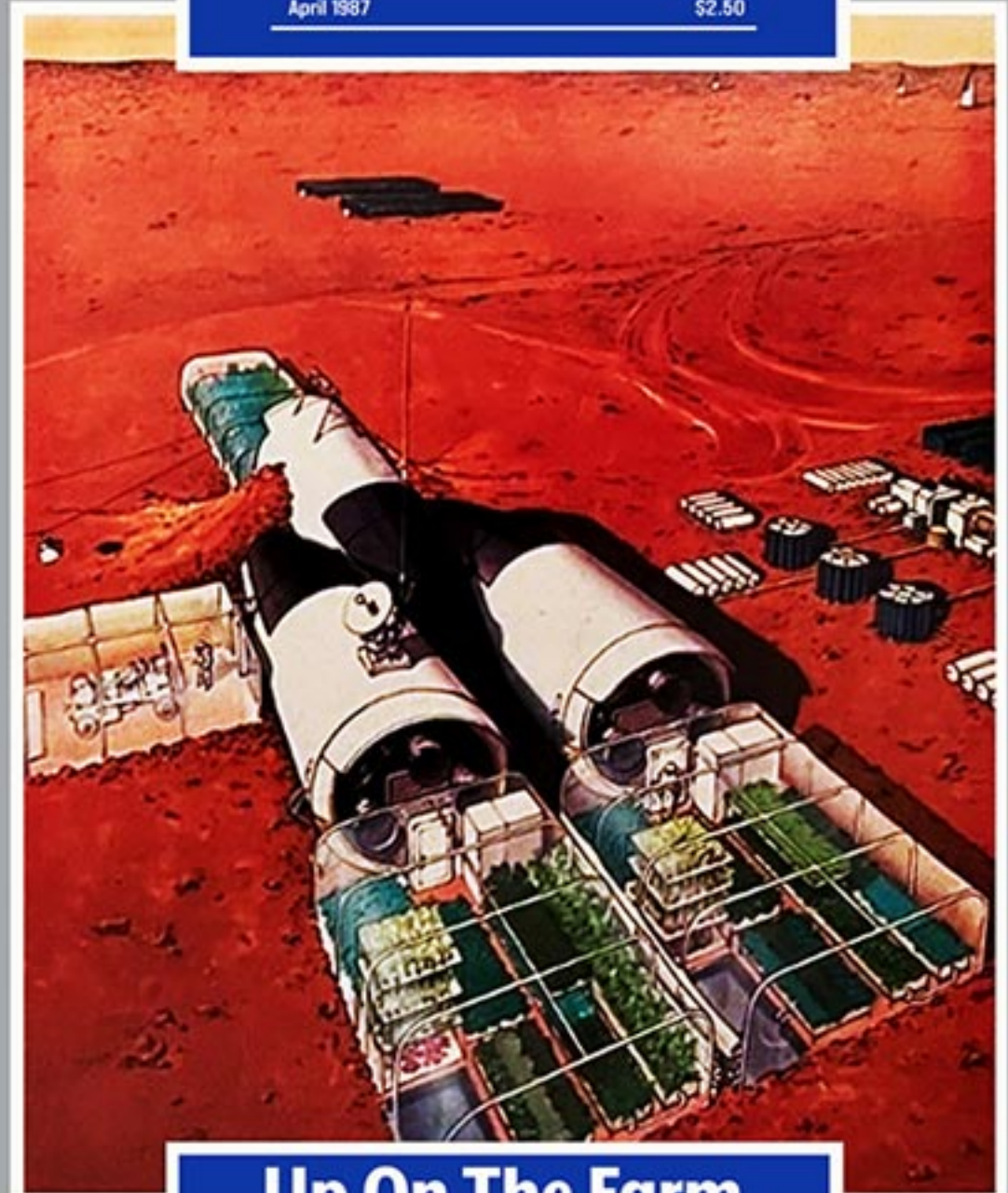


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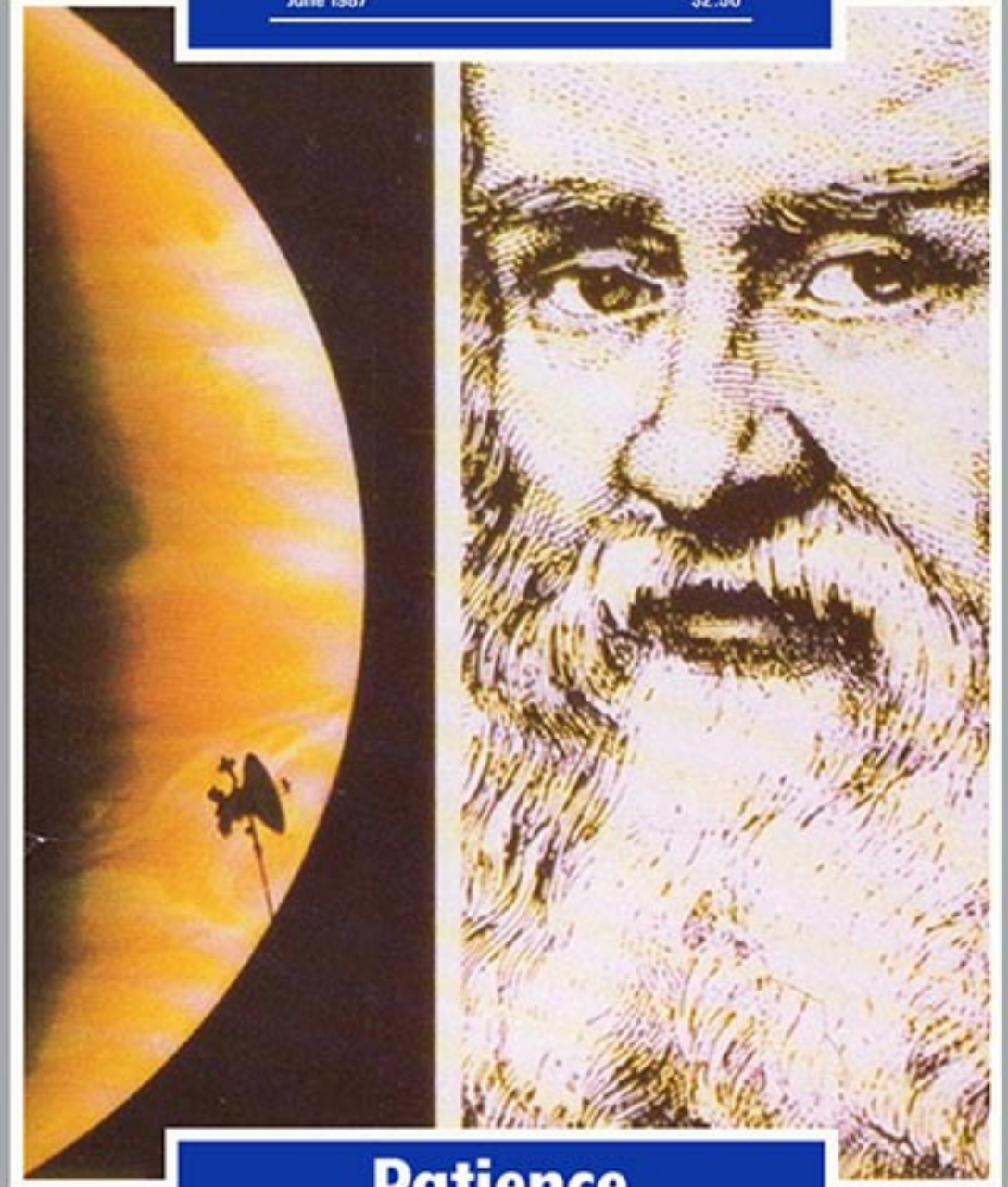


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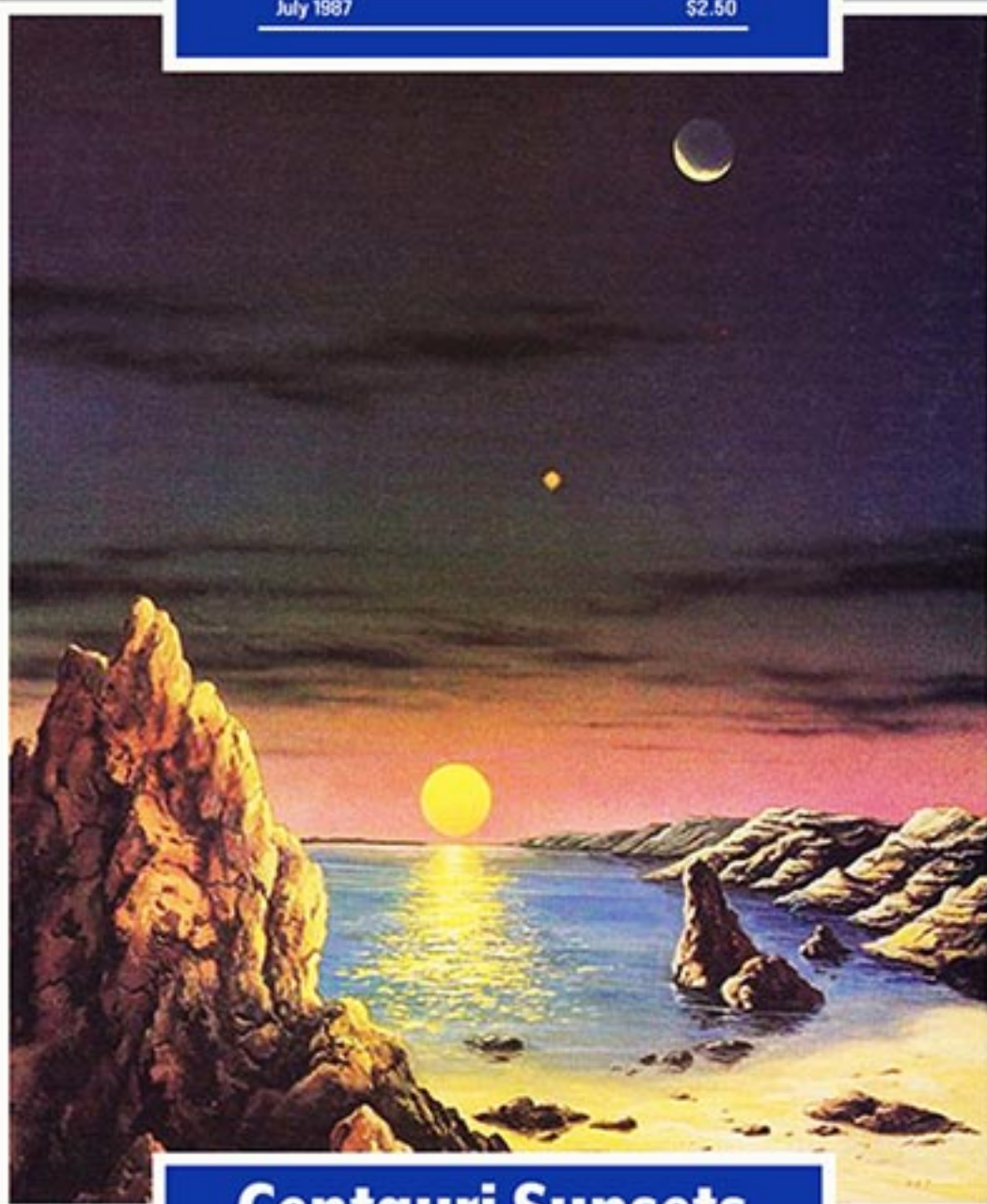


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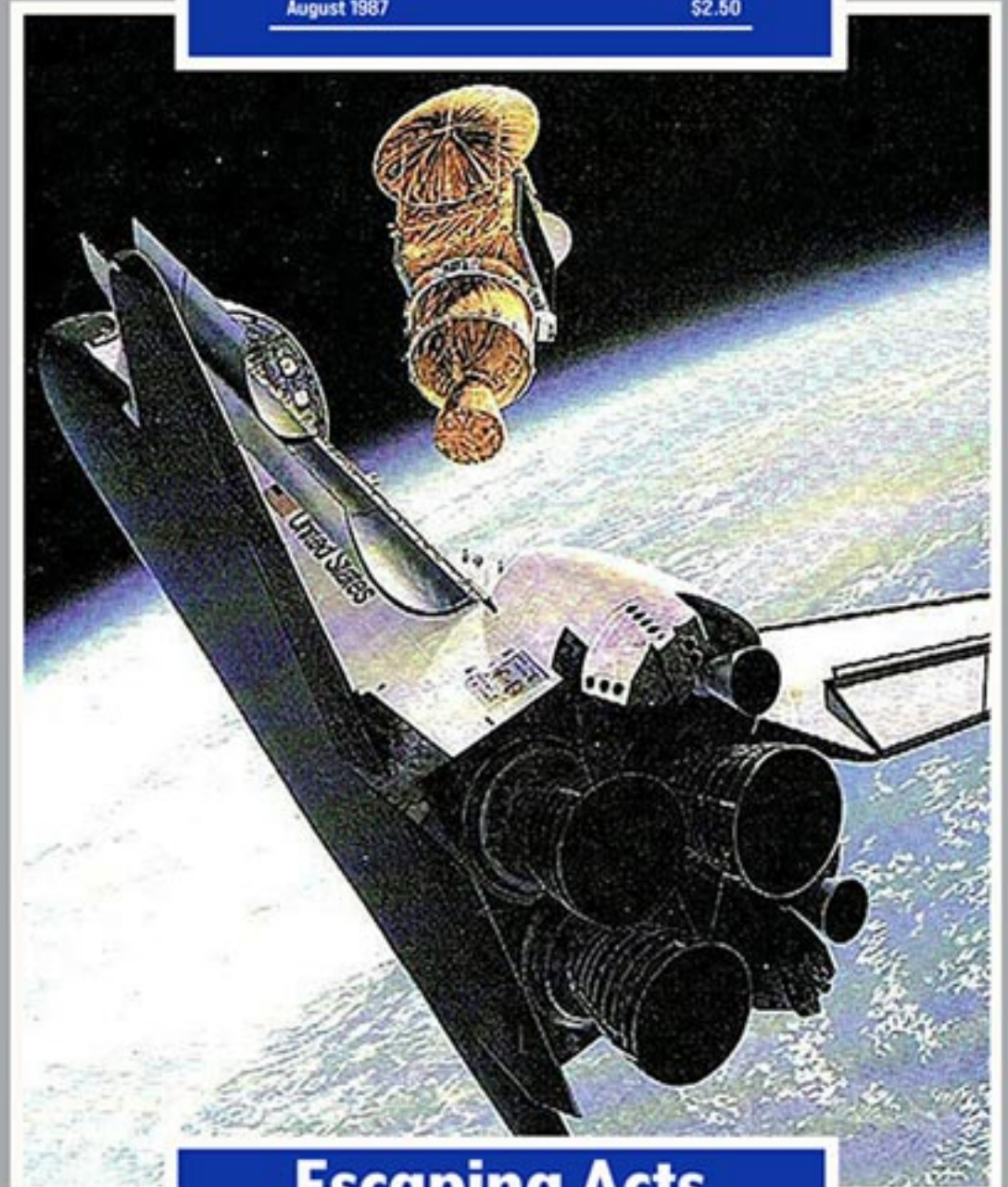


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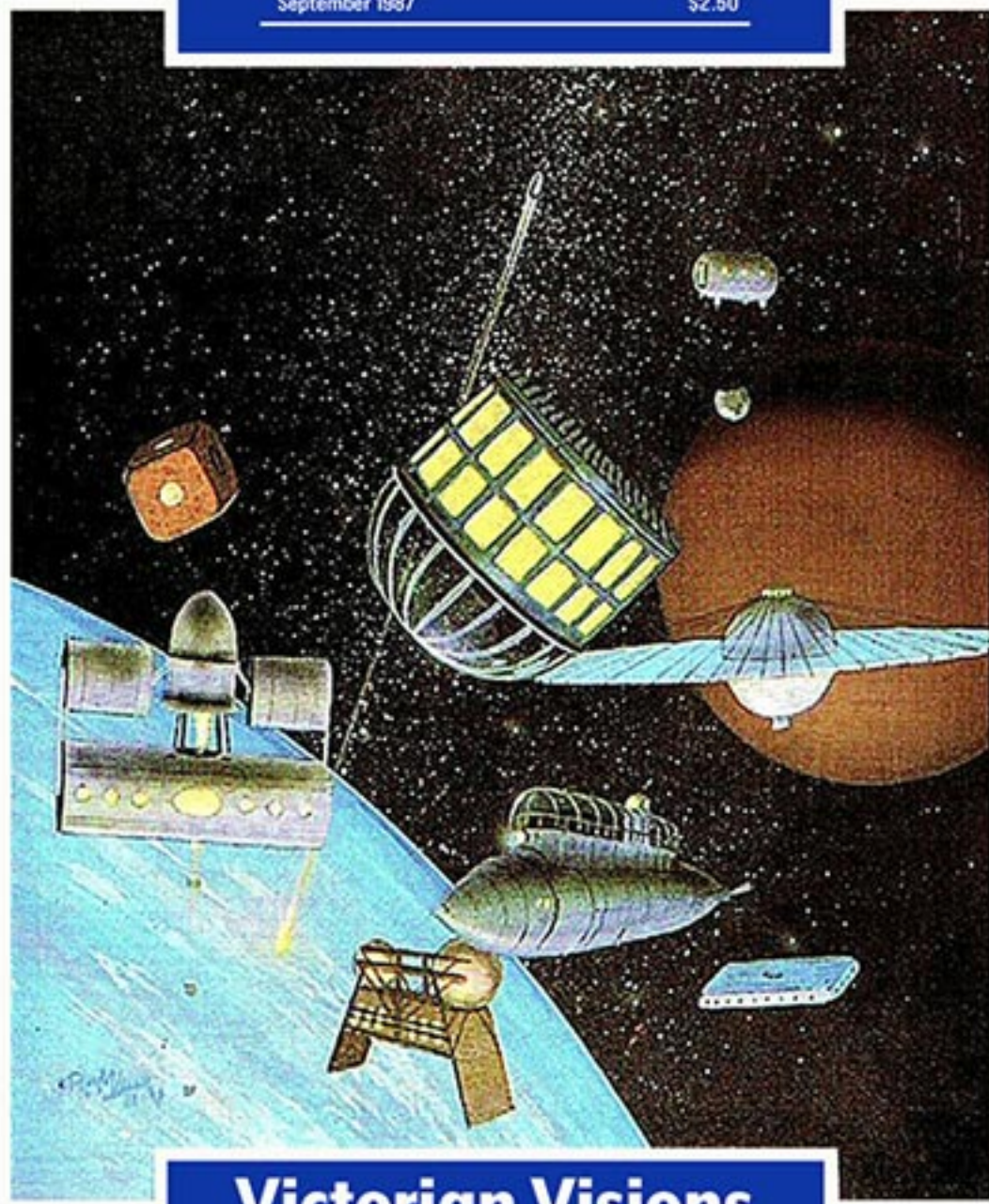
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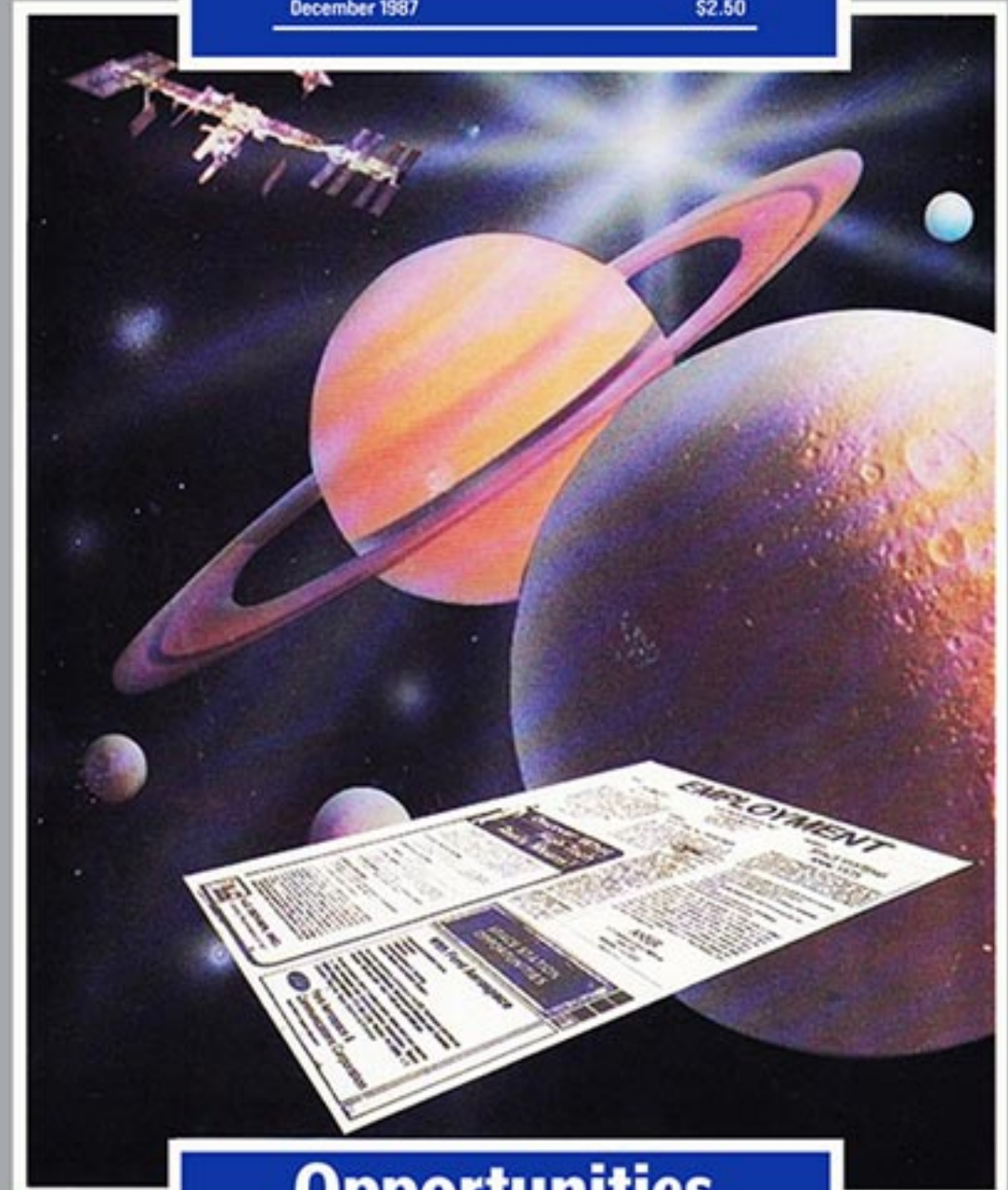


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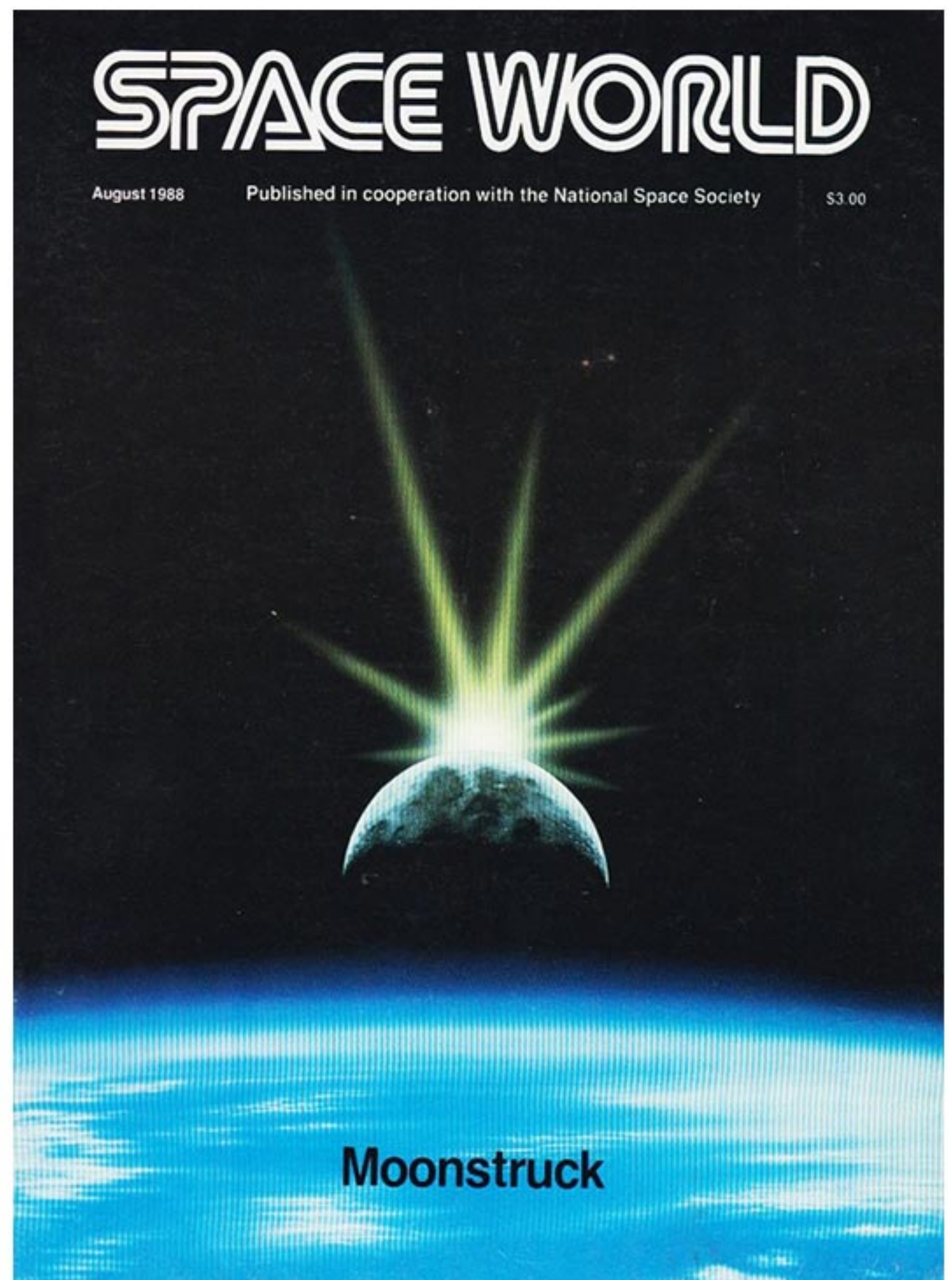
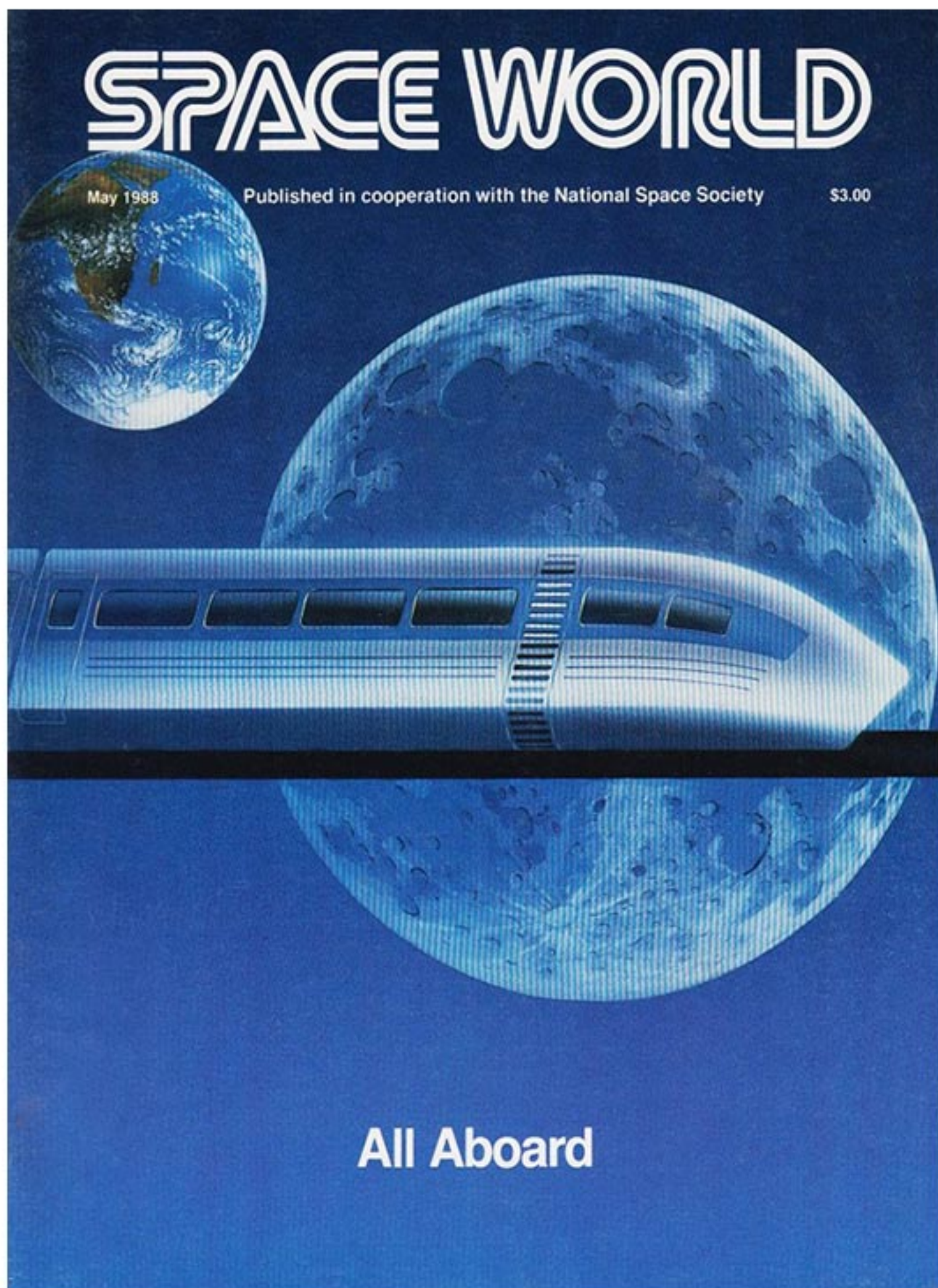
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